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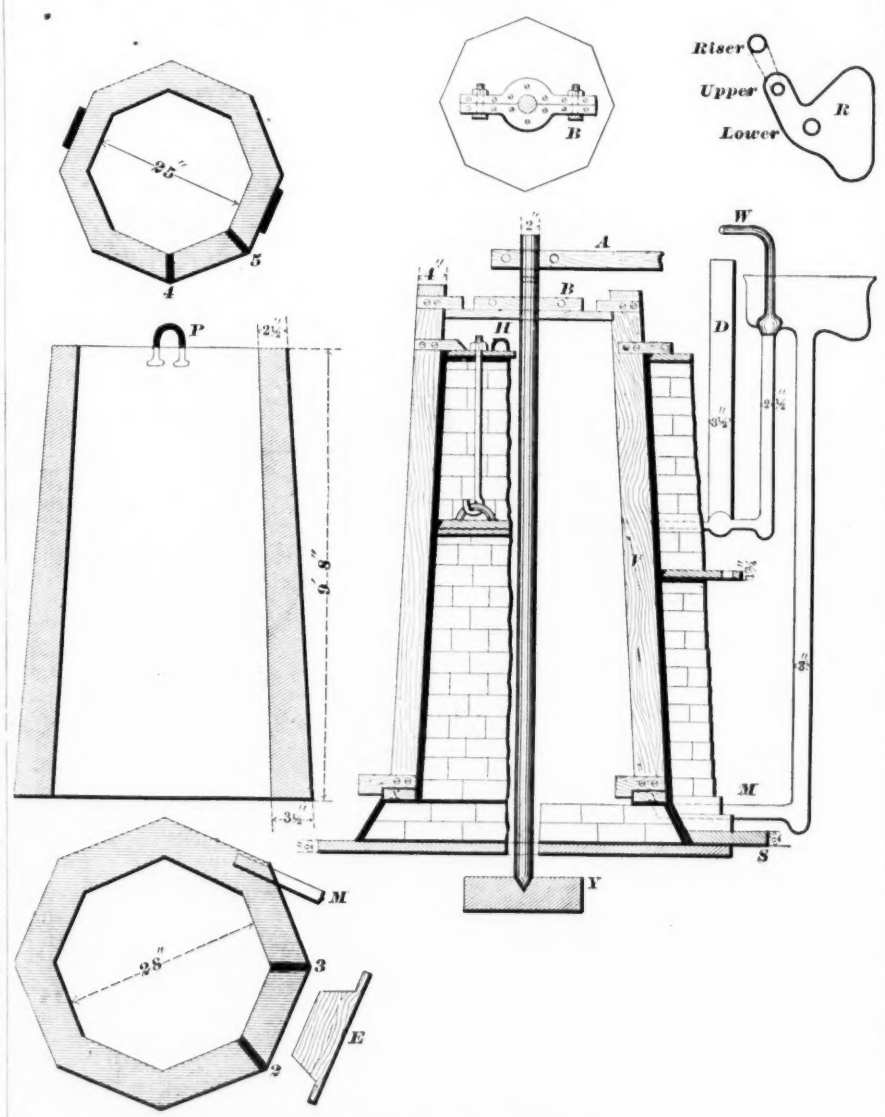
Sweeping an Octagonal Loam Mould.

BY THOMAS D. WEST.

The sweeping of loam moulds that are not cylindrical or round in form calls for an entire change in the manner of operating, and often the moulder's skill is tested in trying to invent some rigging that will work well. There are always two or three ways to mould any casting, and that plan should be adopted that will cause the least risk of losing the casting. The plan adopted by one moulder might not be used by another, each one seeing different ways of handling the job so as to insure its safety or do it quickly. When speed and safety are considered and combined, it will sometimes require the highest mechanical ability and judgment to make them work together successfully, and to tell whether the moulder has adopted the best plan for moulding an intricate piece requires the judgment of a thoroughly practical moulder.

It is a question if there is not more pattern making done for loam moulding than is necessary. This statement is not made to deprive the pattern maker of work, but to intimate that the less pattern-making there is done for loam work the better it is for the mould and casting. When there is a pattern used, and it is drawn out of the mould, the surface of the mould presents an uneven face, full of hollows. This is caused by bricks being laid on top of others, under which the mud is not yet dry. If the loam between the pattern and brick is set, and cemented to the brick, when the top brick is rubbed and laid on, it presses the under one back, and, the loam sticking to it, leaves the hollows as stated. In some cases the loam, not being set, will stick to the pattern, and when the brick is pressed back there will be a cavity left between the loam and brick, and when the pressure of the melted iron comes on it, it may press it back, so as to cause a swell on the casting; or, should the air or gas confined in this cavity not find escape through the joints or brick, it will pass through the loam, or face of the mould, into the liquid iron, and cause a scab on the casting. The only remedy for this is for the moulder to use the mud as stiff as the job will allow, and lay on the bricks with care, or lose time in waiting for the loam to set.

When working without a pattern this care need not be taken, nor time lost. Allowing there are no risks from the above causes, there are still other objections to the whole pattern, one of which is the extra work involved in finishing a mould with loam built against wood. The wood must be rubbed over with oil to keep the loam from sticking to it, and with the best of oil some of the loam will still stick to the pattern, causing the face of the mould to be started all over, leaving thin flakes of loam hanging to the surface of the mould. Or perhaps the pattern, although well soaked in water before using, will expand so that some joints or portions of it will project beyond the general surface; and when the pattern is drawn, it will start and pull down the loam. In finishing such moulds, if the oil is not all washed from the face of the mould, the loam put on to fill up the hollows will not unite well, and will be liable to scab the casting, or the blacking will not hold fast to the mould when it is poured, thereby causing blacking scabs, which are very aggravating to the eye, and are so thin that, if chipped off, the white spots will look worse than the scab, if left on, and what to do with them is sometimes quite annoying. When loam is rubbed on to the face of bricks, and then swept off with a revolving sweep, or with a sweep worked by hand in any direction, as may be required for sweeping between frames or skeletons of patterns, the moulder is sure that his loam is packed on to the surface of the bricks in a reliable manner, and with the sweep and fine loam he can make the face of the mould so smooth as to require little or no finishing with tools, which saves labor; and not only that, but too much sleeking with tools is ofttimes a cause of scabs on castings.



AN OCTAGONAL LOAM MOULD.

The octagonal cuts shown are the top and bottom view of a steel ingot mould, the elevation of which shows the length and thickness. The engravings show also the way it was moulded.

Cast iron ingot moulds for standard steel ingots, such as are used in the manufacture of steel rails, are sometimes made in dry and sometimes in green sand, and the rigging for moulding them is constructed so as to make them rapidly. Ingot moulds weighing about 2,200 pounds, a moulder and helper will make four or five of in one day. The ingot mould shown in engraving took over one week to make. It was made to cast a steel ingot for a large shaft, and may never be used again. It was made with the least expense of pattern making and rigging possible, and seems appropriate for illustrating sweeping that cannot be done by the ordinary means; also for showing a plan of gating and running that can be used for other castings with good advantage This casting being over nine feet long, and smaller at the top than at the bottom, it would not answer to drop the metal from the top, as in falling it would strike and cut the slanting surface of the core, and cause the casting to be scabby, which would condemn it. The inside of these castings must be smoother and more regular than most other castings I know of. If a cylinder has a clean scab inside, it can be bored out, but if an ingot mould has a scab, or even a swell, on the inside of it, it is taken to the drop to be broken up. After the steel poured into an ingot mould is set, the mould is hoisted off the ingot by the two staples, one of which is shown at P, and should there be a swell or scab on the inside surface of the mould, it would prevent the steel ingot from coming out of the mould. Should the scabs or swells be chipped off, the broken skin of the iron would allow the hot steel to eat into it and unite the steel and iron.

The length of this casting being so great, it would not be safe to have run it all from the bottom gates, as the iron would be dull before it reached the top, causing the casting to be cold shut, which would also condemn it. When moulding it I made a runner a little above the middle, as shown, so that when the metal running into the mould at the bottom runner came up to the top runner, I could see it by looking down the large riser D, at which point I lifted the iron plug W, and the hot, clean iron then ran into the mould through the top runner. Should this iron have run into the mould before the iron from the lower runner reached this point, the top iron would have run against the face of the mould and cut into it; whereas the top iron, not being let in until the bottom was up, prevented the top runner from forcing the metal against the face of the core, and, as it was iron running into iron, the danger of cutting the mould was very slight.

The cut R shows a plan of the pouring basin, the distribution of the lower and upper pouring gates, and also the riser. The runners and gates were all made in cores, and set one on top of the other as the mould was rammed up. The lower gate and runner were made larger than the upper ones, on account of more iron having to be run in and be forced up to the top.

When a casting is poured from the bottom it requires a larger runner than if poured from the top, as the more a mould fills up the slower the iron goes in. The iron may rise very fast on the start, and, before a high mould is filled to the top, go in so slowly as to cause the casting to be cold shut.

When moulding this ingot casting, an octagonal frame, x x, the same size and form as the bottom of the casting, was used as a guide in building the foundation and beveling joint for the outside to be guided off and on by, and when the bricks were laid high enough to admit of placing a runner under the mould, as shown at M M, a sweep was fastened on the spindle, and a level bed of loam was swept up, and the frame x x laid on it and centered. After this the outside lifting ring S, was put on, bricks built up level with the frame x x, and the wooden plate B, bolted on the spindle, about 8″ above the height the mould was to be made. To get the faces of the top and bottom frames parallel with each other, a plumb bob was hung from one of the top corners, reaching down to a corner on the bottom frame, and, when set right, the top was bolted tight to the spindle, and the outside bricks were laid. About every two feet loam was rubbed on and swept off with the long strike, or wooden straight edge, V, the bottom of which has for a guide the inside of the frame x x. After the first two feet were built and loamed up, a light, handy straight edge, put against the face of the mould, was used for a guide in laying the bricks. After the outside was built and hoisted off, the spindle was set back, and the core was built in a solid, reliable manner. Had this core been a round one, an 8″ wall would have been strong enough to resist the pressure for the lower two feet, and the rest of the way a 4″ wall would have held it. The pressure of iron on a round core is the same as the pressure on a stone or brick arch. If it is built right, the more pressure the greater the resistance. But to attempt to build a flat surface of stone or brick alone to support or withstand a pressure, either in moulding, bridge or house building, would be the height of folly. How

to build a reliable brick core will be illustrated in a future number.

On account of this mould being too high to be admitted into the oven, it was parted as shown. The outside was parted lower down than the core, so as to give a chance to daub up and dry the joint when closing the mould; for, should there be any unevenness or a fin at this joint, it would condemn the casting. The top section of the core is lifted by two hooks H, and the bottom section with the foundation plate. The arm A, is for holding the top of the spindle steady, and Y is an iron block bedded in the floor, and having a seat to hold and center the bottom.

The cope or covering used was a perforated iron plate, daubed or rammed with core sand, and having the lifting hooks or staples P, built in it.

This ingot casting could be moulded by having upright strips of wood fastened into the top and bottom frames as shown at 2, 3, 4 and 5, thus making a skeleton pattern with which to build up the center core first; using the hand sweep E between the upright frames, for a guide in laying the bricks and putting on the coarse loam. To finish the core with fine loam a long straight edge should be used, on account of the casting being thicker at the bottom than at the top. When the core is loam finished, fill up between the upright frames with damp moulding sand, in a solid manner, and sweep it off even with the outside, over which brush some charcoal wet with water, or oil, with parting sand sprinkled over it to make the outside part from the core. When all is ready build up the outside against the thickness surface, and with the center core bolted down to the bottom plate, hoist off the outside.

Should the question be asked which is the best plan by which to make a good casting in the least time, I should answer that the plan fully shown with cuts is the one I choose after considering all the essential points.

According to the report of the New Jersey bureau of labor and industries, the average machinist in that State earns $779.01, and spends $654.75 yearly, saving $124.26; while the average saving of all workingmen is $43.26.

Silk would seem to be an expensive covering for steam boilers, but it is said to be remarkably effective; and, also, that in the places where the manufacture is carried on extensively, the refuse which could be used for this purpose is of little value.

Steam Engine Economy.

BY F. F. HEMENWAY.

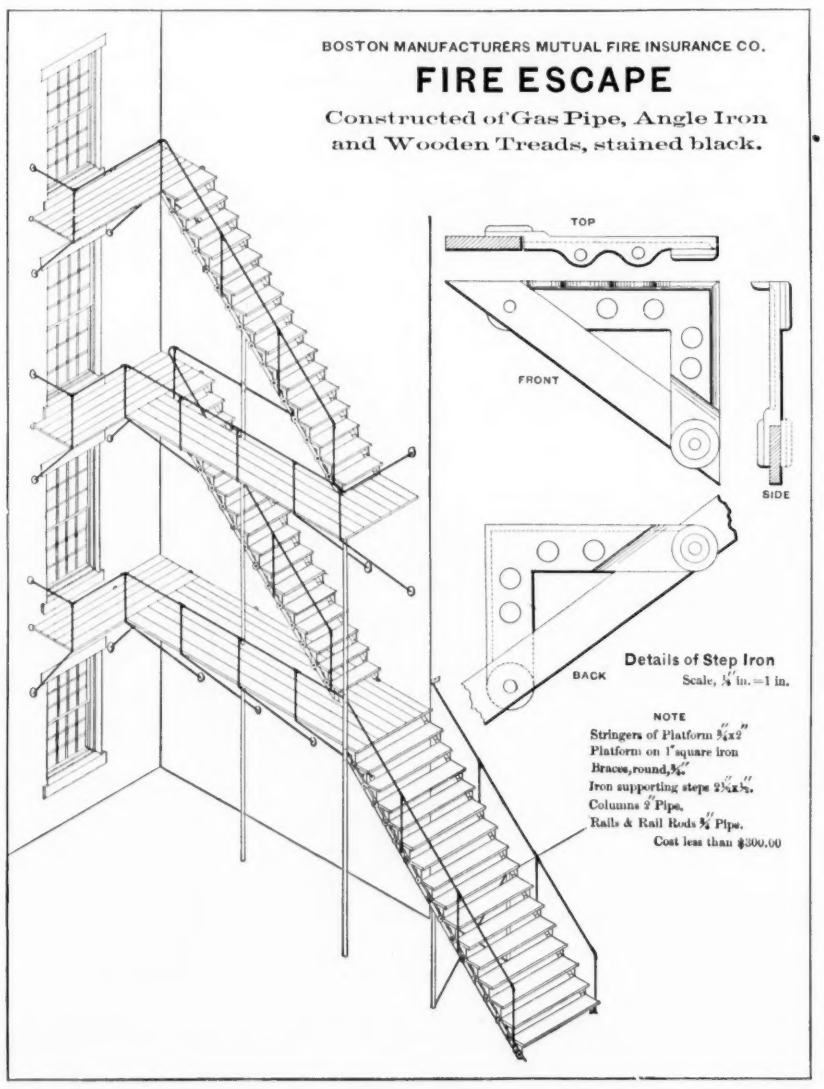
However much the subject of steam engine economy may be attended to in the main feature; that is, by using a first-class automatic or other style of engine, designed to use steam with good economy, and well adapted in size to the work, it will be found that there are other things—sometimes called small things—that require attention; in fact, steam engine economy, or the economical use of coal in generating steam, and the economical use of the steam after it is generated, is as a whole made up of factors, small in themselves, but each of which has its importance, as modifying the final results.

Not unfrequently the purchaser will pay a good price for an engine—and it is usually policy to do so, or in other words to buy the best—and then for the saving of a few dollars will fail to make use of other appliances, by which more coal could be saved than the high-priced engine is saving him.

Parties who aim to build engines to work with good economy often have occasion to become disgusted, because it is too apt to be assumed that the possession of such an engine means economy in the use of fuel, without reference to anything else. In this respect a steam engine is simply a *tool*, with which it is—as in the instance of any other tool—easier to do poor work than good work.

Without at this time going into the relative economy of condensing and non-condensing engines, it is a fact that for various reasons a large number of non-condensing engines are and will continue to be used, and one thing that makes it possible with such an engine to *approximate* the economy of a condensing engine is that advantage may be taken of the heat thrown away in the former, to heat the feed water nearly to the boiling point before it enters the boiler; notwithstanding which, however, comparatively few non-condensing engines are provided with a heater, or at best with only an apology for one, and which does not get the results attainable by the use of a good one.

A difference in economy equal to ten or fifteen per cent. between two steam engines is properly considered of considerable importance—enough usually to determine the choice in favor of the best, without much reference to the cost—yet a loss as great as this in feeding cold water, and throwing away the heat of the exhaust steam, is the rule rather than the exception. This would not be so strange if there was anything mysterious about it, but the *direct* saving in fuel in this way is a matter of plain calculation, and by comparing this saving with the cost of a heater, the advisability of the investment necessary to procure one may be determined.



FIRE ESCAPE.

Thus assuming that an engine is developing 100 horse power, and using 28 pounds of steam per horse power per hour, at a pressure of 70 pounds, and that it takes four pounds of coal to evaporate this water under this pressure and from a temperature of 60°, the consumption of coal will be for ten hours: $100 \times 4 \times 10 = 4{,}000$ pounds. Every pound of steam will contain 1,210 units of heat, of which 60 units were contained in the water, leaving to be imparted $1{,}210 - 60 = 1{,}150$ units.

If, instead of this, the feed water is heated to 200°, $200 - 60 = 140$ less units of heat would have to be imparted, and the saving of coal would be more than 12 per cent., or say 75 tons in a year. This may not look large, but at average prices it would pay the interest on about a dozen heaters, and is one of the several items that go to make up the total of steam engine economy. If it could be made plain to the party about to buy a steam engine, that there would be a difference of 75 tons of coal a year in favor of any particular one, *he would buy that one.* Show the same party that a heater will save that amount of coal, and the chances are that he won't pay the money he will save in one year for it.

In this showing nothing has been said of the *indirect* gain brought about by keeping the boiler cleaner, and hence in a more effective condition; nor of the loss brought about by pumping cold water directly into the boiler—loss in the way of fuel beyond that due to the difference in temperature of the feed—nor of the damaging effect on the boiler brought about by the sudden local change in temperature. This gain and this loss are known to exist, but they are not clearly matters for figures, besides the gain is apparent enough without referring to them.

There is another condition however that is frequently found, which is where steam is used for various other purposes. It is frequently the case that as much steam is used in this way as for the engine, when the saving referred to the coal used for the engine may be as high as twenty-five per cent., or even more.

Another way in which the heat in the exhaust steam can (in this climate) generally be used for, more than one-half the year, is in warming the rooms in the building. It is well known that but little of the heat contained in the steam is converted into useful work in the cylinder of a steam engine; the larger part of it finding its way out of doors with the exhaust steam. But a small portion of this can be utilized in heating the feed water, and nearly all that remains can be used, for perhaps six months in the year, for warming the rooms connected with the establishment; and yet, as in the case of the heater, the utilization of it in this way is comparatively uncommon.

As a rule, so long as there is heat required in a building, and exhaust steam is seen escaping, there is a chance for securing better economy in the use of steam.

A heater, so far from increasing the back pressure in the cylinder, should have a tendency to diminish it, and should in all cases heat the water to 200°. It will go righ along paying for itself in at least three distinct ways: by the saving of fuel, in the saving of repairs, and by allowing the use of a smaller boiler, or what is often of more importance, by permitting easier firing.

It is always safe to conclude that there is the very best economy in the use of a heater where fuel is of any consequence, and generally it pays to use one where it is of little value.

Protection from Emery Wheel Dust.

One of the most common objections to the use of emery wheels is the inhaling of the dust arising from their use, as well as the particles of metal cut from the pieces being operated upon. This is but little more objectionable than the injury to the eyes from the presence of these same foreign substances. In Germany, masks are made of mica that entirely cover and protect the face, and from which an air tube is carried around between the shoulders, where it is provided with a mouth-piece filled with a saturated sponge, through which the air supply is drawn. The mica is transparent, and not easily broken. In this country exhaust fans are sometimes used to carry away the dust-laden air, inducing a constant current of fresh air to take the place of that removed by the fan. This alone is not a protection against particles of considerable size that are liable to strike the face with violence, often severely injuring the eye. It would seem probable that a combination of the two plans might work very satisfactorily.

Suggestions from Practice.

BY WM. J. WILLIAMS.

Don't use bolts with six-sided or hexagonal heads and nuts in flanges of steam pipe. A bolt with a six-sided nut is only admissible when the pipe is run close to a wall, where it is sometimes an advantage to have a six-sided nut on the bolt in the flange hole next the wall, because it is often possible to move a six-sided nut enough to get the wrench on the next side, when it would be impossible to do so with a square nut.

Bolts with hexagonal heads in steam pipe flanges are an abomination. In putting up pipe with new bolts, no particular trouble will be likely to occur in screwing them up; but after they have been in use some time, and it becomes necessary to renew the joints, then the trouble begins. In trying to unscrew them, the bolt turns in the holes; a wrench will take no hold, or there is not room to use it; all attempts to block it are unsuccessful, and after many attempts to do so, the corners are torn off, and no other resort is left but to split the nut, and probably lose the bolt as well, besides the loss of time and a risk of breaking the flange. A bolt with a square head can be held with a wrench, if there is room to use it, or successfully prevented from turning with any suitable piece of iron between it and the pipe.

Never use a bolt longer than necessary. When the joint is screwed up the nut should never be more than full, and had better be a thread short of being full than a half thread over. If the bolts are too long use washers, sufficient to prevent the bolt from being drawn too far through the nut. If a washer is placed under a nut on a rough cast-iron flange, it will be found to work much more satisfactorily.

Never tighten the bolts first that are easiest to get at. On the contrary go for the hardest one, and having done this, then pay attention to the one opposite, then the next hardest is in order; and following this its opposite, and so on around the flange. When all have been made equally tight, they may be further tightened one after the other, but don't slight the contrary ones. To screw up the easiest bolts first will be likely to result in a leaky joint almost at the start, and that it will be a joint of short duration is certain.

In the joint which unites a section of steam pipe to a stop valve, on account of the close proximity of the flange to the body, two or

more bolts have to be inverted, and often there is not room to turn the nut, and the bolt has to be screwed into the nut, instead of the nut on the bolt—a very unsatisfactory way under the most favorable circumstances. Stud bolts, or bolts with a nut on each end, should always be used in such positions, as in remaking joints their use will be found to be a decided advantage over a bolt, with its head and nut in reversed positions.

The life of a gum joint does not depend on the amount of screwing done when it is made, but its lasting qualities are materially increased by taking occasion every morning to try all nuts on the flanges before admitting steam into the pipe. Don't undertake to do too much screwing for the second or third time, because the gum is yet comparatively soft, and may be forced from between the flanges. A close attention to newly-made joints for a few days, with the aid of a wrench, has been found to save a heap of trouble.

It often happens in renewing a joint in a crowded place that it is impossible to spring the flanges as far apart as desirable to get at the old joint, which maliciously sticks to the flanges, coming off bit by bit, and sometimes causing considerable doubt as to whether it is all off or not.

If the new gasket be rubbed on both sides with a piece of common brown soap until some of it adheres, before being placed between the flanges, it will, when necessary to renew it, come off with comparative ease.

A useful tool to assist in taking off an old gasket is a thin piece of steel about one and a half inches wide, with one sharp edge and long enough to reach across the flanges, being held at the ends with both hands, and inserted between the flange and the joint to be removed at the upper part pressing downward, when it will be removed with dispatch.

If the faces of flanges are good, a joint made of sheet gum, one-sixteenth of an inch thick, is better than if it were thicker. As a rule, the thinner the joint the better, as there is not so much material to contract, nor so much surface at the edge of the joint for the steam to act against to blow it out.

In running a line of steam pipe, bring the faces of opposite flanges to be united to lay naturally parallel to each other, and don't spring them, in order to compel them to assume this position. When they cannot be made to lay parallel to each other, and are open much more on one side than the other, procure a piece of sheet gum which is thick enough to fill the widest spaces, cut out the joints and pare them down with a sharp knife, so as to fill up between the flanges in a neat manner.

If the wide space between the flanges be greater than the thickness of the gum at hand, cut from it such portions of rings as may be wanted, pare them down to suit, lay the parts of rings so cut and dressed on a whole ring, bind them together with lamp wick, and cover with white lead, and insert them between the flanges for which they were made. Give such joints particular attention with the wrench.

It often happens in repairing that a new joint cannot be placed in position between flanges, whole; for instance, the front head of a cylinder, when it becomes necessary to cut it to get it over the piston rod. In such a case, cut the ring to the desired size, and scribe with any sharp-pointed instrument a straight line across it. Turn it over and scribe on the opposite side, from one to two inches apart, according to the size of the ring. Now take a sharp knife and cut carefully half way through the thickness at each line, or to where there is a layer of canvas; raise up the edge where cut, and strip back carefully to the other cut, when the ring or gasket can be got past the obstacle, and sewed or tied together at the ends. A quicker way, however, is to peg them together with a few shoemaker's pegs, holes being previously made with some sharp-pointed instrument, one at a time, and the peg driven home, any part of it extending through the gum to be trimmed off with a knife. Or the ring may be cut in the form of a scarf, and joined together in the same manner, but pegging has been found to be the most expeditious, and time is generally an important factor.

If a manhead gasket is too large, cut it across, lay it over the manhead, draw one end over the other until it suits the head, cut out as much as will allow it to overlap, say, one inch, dovetail the two ends, and lay them one within the other. If neatly done, it will prove to be as good as if the gasket had not been cut. It may also be scarfed and pegged with good results.

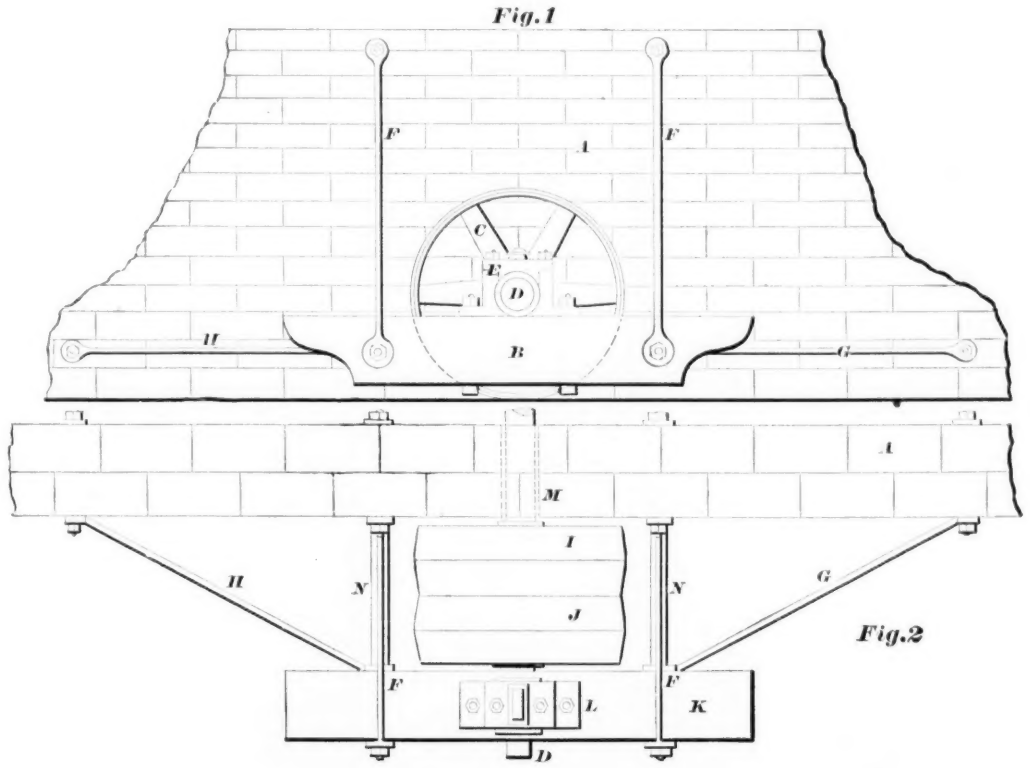


Fig. 1

Fig. 2

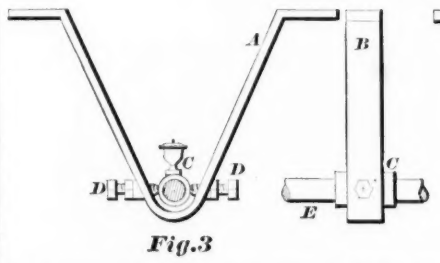


Fig. 3

To prevent a gum joint from sticking to both flanges in a position where it has to be occasionally broken, chalk it on the side that should not stick.

Rubbing a gum gasket with plumbago also enables it to be used oftener than if not so treated. There is a sheet gum in the market having plumbago in its composition, for which great lasting qualities are claimed.

Experience with a sheet gum for joints, having wire gauze in it, instead of canvas, proved it to be a very satisfactory article in making joints, having staying qualities in positions where ordinary sheet gum would last but a short time. It requires a good deal of screwing up but it will stand it, and when done there is practically a metal joint, with just enough gum to fill up any bad places in the joint-bearing surfaces.

Another good plan for preventing gum gaskets from sticking to flanges, is to give them a coat of a mixture of plumbago and tallow. The latter disappears with the heat, but the former remains, the gasket coming off easily when required.

Shop Kinks.

No. 25.

By L. F. Lyne.

CHEAP AND DURABLE WALL BRACKET AND SHAFT HANGERS.

Frequently in mill work, and also in extending shops and factories, it becomes necessary to transmit power by means of a belt from the main line to the new shaft, before entering the new apartment; in other words, the transmission of power from one line shaft to the other, without the wall of the new apartment. Especially is this necessary in transmitting power to the line shaft for the picker room in cotton mills, which course is rendered necessary, as the friction of belts is liable to set fire to the fine fibers of cotton floating in the air and lying upon the floor beams and hangers.

On one occasion in fitting up a new shop, I found it necessary to belt off from the main line shaft to drive the line shaft in the planing mill. The transmission of power was to be made without the wall of the planing mill, so that by moving a lever belt-shifter in the mill, the line shaft could be started and stopped.

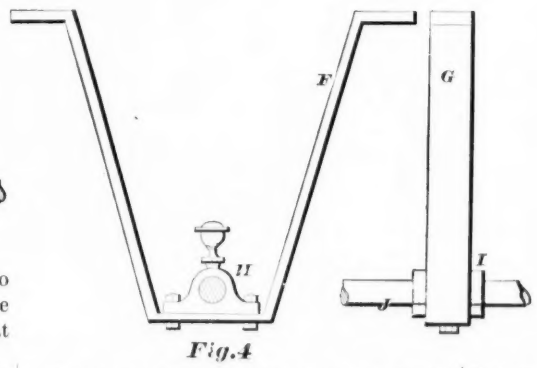


Fig. 4

The draughtsman designed and made the drawings of an elaborate cast-iron bracket, to be bolted to the wall, for supporting the box to be placed upon the end of the shaft in the mill. Such a contrivance was both expensive and extravagant for that particular place; furthermore, the pattern makers were too busy to make the pattern.

Our mutual friend "Chordal" quite recently authorized me to say in this connection that he designed a similar bracket awhile ago for the same purpose, and his wall bracket for supporting the end box of the shaft cost about $75. He also expressed himself pleased with the plan herein described.

This plan is represented in Fig. 1 of the accompanying engravings, where *A* is the wall of the mill, and *D* the line shaft with the pulley *C*, for driving the wood-working machinery. Fig. 1 being an elevation and Fig. 2 a plan, the contrivance is shown quite plainly. A tight-and-loose pulley *I* and *J*, were placed upon the shaft for use when required.

To support the box *E L*, upon the end of the shaft, I ordered the carpenter to get out a stick of square timber 6″ × 6″, about 40″ long, having an ogee at each end, as shown at *B K*. Two pieces of 1″ wrought-iron pipe, *N N*, were cut of a sufficient length to give the pulleys ample room, after which rods of ¾″ round iron were inserted through the timber, pipes and wall. For supporting the timber vertically, two braces, *F F*, of ½″ round iron were applied, as shown, the angle of both being such as to clear the belt properly. To prevent the shaft from being pulled out of line by the strain of the belt, two other braces *G H*, also of ½″ round iron, were applied, as shown. When all was ready the braces were all tightened by bolts running through the wall.

It will be seen that this contrivance, besides being very cheap, makes a good, strong support for the box, and is not at all unsightly.

The one here described has been in use about six years, without requiring any adjustment since it was first put up, and it cost but a small fraction of $75.

Another subject of great annoyance in fitting up new buildings and apartments is the difficulty of procuring shaft hangers having a suitable drop.

For instance, it is desired to run a short shaft through a partition into the tool room, or other apartment, to drive a number of machines and tools.

The timbers or ceiling within the large room is about 18″ above that in the smaller room. The question arises, how are we to obtain a suitable hanger for the large room to support the end of the 2″ shaft?

I had an experience of this kind, and will describe the way I worked out of the difficulty. I had no hangers of any description; neither had I any means of obtaining any cast-iron hangers. The work was greatly needed, so I ordered several hangers like those shown in Fig. 3, having 18″ drop for the small room, and one with 36″ drop for the end of the shaft in the large room.

The short hangers were made of ⅝″ x 3″ flat bar iron, bent to the shape shown at *A B*, the lower end being bent to a circle.

These hangers were then clamped upon an angle plate, a drill was run through both parts, and followed by a ¾″ nut tap for the conical pointed set screws *D D*. The pivoted boxes *C*, were simply bushings of brass, or cast iron, which were bored, to slip over the shaft *E*, and had oil cups for lubricating the bearings. When the hangers were adjusted to the right height by shims under the feet, the shaft was squared by adjusting the set screws *D D*. Each of these set screws had a jam nut with a beveled washer under it, to furnish a flat bearing for the nut. The long hanger having 36″ drop was made of ¾″ x 3″ flat bar iron. These hangers look cheap, but they answer the requirements for all kinds of ordinary work, where the person in charge is not too fastidious. It might be supposed that these hangers would spring very much, but they do not. I can refer to hangers of this class made by myself, and put up years ago, which have given entire satisfaction since they have been in use. The idea of making hangers in this way is original with me, and I have found no one, thus far, who has seen hangers made in this way. The method described is here given for young mechanics and others, who are called upon to get up hangers cheaply, which will be sure to meet the requirements.

On one occasion I had a lot of castings, of the shape shown at *H*, in Fig. 4. A number of these castings were used in constructing hangers for shafting. These hangers were made of ⅝″ x 3″ flat bar iron, bent to the shape shown at *F G*. The boxes *H I*, rested upon the lower flat part of the hanger, and were held in place by two bolts. The holes for these bolts were slotted, so that the shaft *J* could be squared by moving the boxes. It could also be leveled by placing shims under the boxes. This style of hanger is only fit for light work, while the other may be used for purposes where a much greater power is required.

Improved Diamond-Pointed Rock Drill and Appliances.

The accompanying illustrations represent certain improved appliances for use in connection with diamond-pointed rock drills, as made by M. C. Bullock, 80 to 88 Market Street, Chicago, Ill.

In boring holes in rock for blasting, it is important that the holes should be perfectly cylindrical, or as nearly so as possible, in order that the full force of the explosive may be fully utilized, and its practical effect increased to the greatest possible extent. In order to work the tools safely and economically it is also necessary that the hole should be straight and the drills of such a form that they will not be deflected from a straight line by crevices or seams.

The cutting edges of the drill should also be capable of penetrating the hardest known rock.

The improved diamond-pointed rock drill shown herewith is intended to accomplish the above-named requirements. It is provided with compound engines, so as to work with the best possible economy.

The cylinders are steam jacketed by means of double shells, steam being supplied direct from the boiler, and, in addition to this, the cylinders are covered with hair felt and the heads protected by Russian-iron covers.

The pipes leading from the small cylinders to the larger ones are double, the space being filled with live steam from the boiler. They are also covered with felt to prevent radiation. By means of a lever the engineer can readily change the engine from compound to high-pressure, live steam being admitted to the large cylinders, and the exhaust from the small ones being turned into the exhaust pipe. This is sometimes necessary and very convenient in raising or lowering a heavy line of rods.

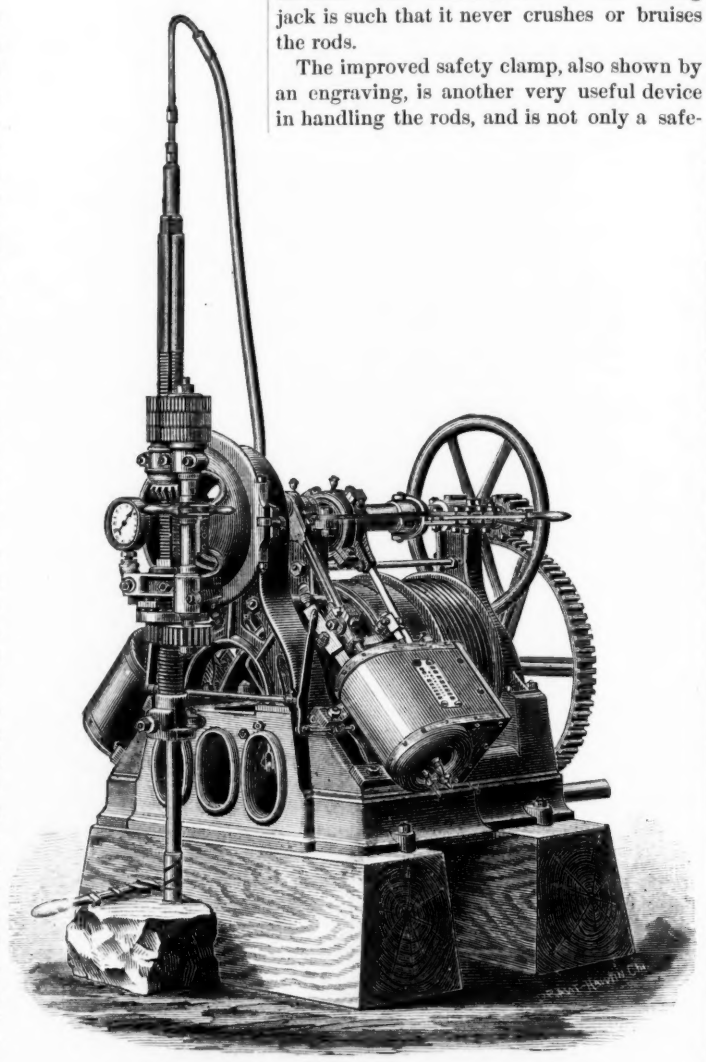
The valves are plain slides. Connections are made from the pistons to the crank by means of cross heads and connecting rods. By a simple reversing gear the motion of this engine may not only be reversed, but steam may be cut off at any part of the stroke desired to effect the best possible economy.

The advantages of the compound engine for certain kinds of work are too well understood to require repetition at this time, but in this instance a high ratio of expansion is secured with plain slide valves operated by a slotted eccentric, thus avoiding a complicated valve motion. The engine takes steam into the smallest cylinder at 90 pounds pressure, which is cut off after following two-thirds of the stroke, completing the remaining one-third on expansion. It is then exhausted into the large cylinder through steam-jacketed pipes, where it performs a proportionate amount of work, from whence it escapes into the open air at a pressure of only ten pounds above the atmosphere. Thus, it would seem, the available force of the steam is well utilized. The piston rods and connecting rods are of improved design; the latter, as well as all the working parts, are of cast steel, are light and may be run at high speeds without vibration. All parts of this engine are easily accessible, and capable of adjustment by an ordinary engineer. This is an important consideration when machinery is taken into mountainous or remote mining districts. This engine can be run forward, backward or stopped by the use of a single lever, so that in hoisting and lowering the load is under the perfect control of the engineer.

This machine has an improved internal-geared hoist, with which the operator can hoist, lower or hold 1,200 feet of rods with the machine without stopping or reversing the engines. These improvements combine the advantages of friction gearing and strength of toothed gearing, without some of their most serious objections. This machine has an improved swivel head, which allows the drill mechanism to swing out of the way while putting the rods into or withdrawing them from the hole; and by loosening one nut the swivel head may be turned around so as to bore at any angle within the circle.

A new thrust register is attached to the swivel head, for indicating the thrust or pressure against the rock as the drill revolves, and by this indicator the operator can tell the thickness of every stratum, while the drill is running, as no two strata are of an equal degree of hardness. It will also tell whether the core is breaking and wedging fast in the core barrel, or if any part of the drill should break suddenly. When an open seam is encountered the indicator not only reveals this fact but also the width of the seam. By watching the indications of the register, the operator can tell just how to regulate the feed so as to suit the character of the rock. Thus an excessive wear of the diamonds forming the cutting edges is obviated.

By following such a course the work accomplished per day is very much increased. The improved method of changing the feed while the machine is running saves much time, and in case the drill encounters a very hard stratum the feed can be instantly adjusted from coarse to fine. Without this improvement there is great danger of ruining the diamonds, by forcing them (beyond their cutting capacity) into the hard rock. The swivel head is also provided with an improved thrust bearing for taking the thrust of the bit against the rock. This bearing is made of hardened cast steel, and converts a sliding into a true rolling motion, which requires no lubrication. Such a bearing necessarily reduces the power required to drive the drill, as it moves freely and does not heat. The feed nut and gears are made of cast steel, the latter being cut to insure smooth running. The bearings are all furnished with solid composition boxes, no Babbitt being used about the machine. The drill rods are 1¾ inches in diameter, made of special thickness, of the best charcoal iron lap-welded tubing, all fitted with Osgood's bayonet clutch coupling which couples or uncouples by giving it one-fourth of a turn. It is stated that this machine will drill a hole 2 inches in diameter, taking out a core $1\frac{7}{16}$ inches diameter to a depth of 1,200 feet in any direction through any kind of rock, and the engines may be used for hoisting from the mines when not required for drilling.



IMPROVED DIAMOND-POINTED ROCK DRILL.

The improved lifting jack, shown in the engraving, is used for withdrawing from, and lowering drill rods into the hole, and is operated as follows: To withdraw rods from the hole, the operator takes hold of the two levers into which the rings of chain are attached; the faces of the levers are cam-shaped, and by pressing down on them the jaws are forced apart by a pair of springs, allowing ample room for them to pass over the end of the drill rod. The operator then starts his hoisting machine, bringing a strain on the two pieces of chain, drawing ends of levers together, and throwing the cam faces against the jaws, which come in contact with the drill rod, gripping it firmly. The jaws have teeth or serrated faces, which prevent their slipping on the rods, and the action of the double cams is such that the greater the strain upon the ring above, the tighter they close upon the rods, thus insuring a positive hold, which never slips under any circumstances. When the rod is hoisted to the required height, the safety clamp is tightened below, and the strain on the rope is withdrawn; the ends of the levers, thus being allowed to drop back to a horizontal position, release the jaws from the rod. The lifting jack is slipped off from the end of this rod, and lowered to take hold of the next length of rod. This operation is repeated each time in taking out the length of rods which the derrick will allow to be handled. This jack effects a great saving in time over the old method of screwing a hoisting plug into the end of a rod each time a single length is hoisted or lowered, and saves the wear on the threads. The construction of this lifting jack is such that it never crushes or bruises the rods.

LIFTING JACK.

The improved safety clamp, also shown by an engraving, is another very useful device in handling the rods, and is not only a safeguard in case of breakage of rope or top of derrick but it also takes the place of one man with a pair of tongs to hold the rods while being coupled or uncoupled. The operation of the device is as follows: When the operator has run the length of his core barrel and wishes to withdraw the rods, he swings the hinged safety clamp apart, as shown, passes it around the rod, putting the pin in place. When he has hoisted the rods to the required height (leaving a coupling joint about six inches above the top of safety clamp), he applies a wrench to the set screw, shown to the right of cut, thereby causing the jaws to take a firm hold of the drill rod. He then takes hold of the coupling with a pair of tongs, just above the safety clamp, giving it one-quarter of a turn, which detaches the coupling with its drill rod. He then raises the upper piece out and sets it down upon the plank floor at one side. He then lowers the lifting jack, as described above, passes it over the end of pipe, bringing enough strain on it to hoist the rod and safety clamp just clear of the floor. He then applies the wrench to the set screw (to the right of cut), slacking it off and allowing the safety clamp to drop back on the floor. By then putting his foot on the lever, shown to the left of cut, he is able to throw the taper jaw out from its seat, leaving the drill rods free to pass between the jaws for either hoisting or lowering.

Should anything break above the safety clamp, the lifting jack would come down and strike upon the top of the wedge-shaped jaw, forcing it down on the angle until it engages the drill rod, holding it from slipping any further, thus preventing the bit and rods from falling to the bottom of the hole, where the force of the fall would not only destroy the diamonds, but also upset the end of the core barrel and core lifter, rendering it almost impossible to withdraw them from the hole.

After the drill rods have all been taken out or returned to the hole, and the operator wishes to remove the safety clamp, he can easily do so by withdrawing the pin, and swinging the safety clamp apart, as shown, thus being able to slip it past the rod.

Some Points About Pins.

The end of a coil of wire, which has been previously straightened, is started into the heading dies by a pair of grooved feed rolls. Upon the end of the wire reaching the heading punch, when at its receded position, the heading dies come together with a tremendous grip and hold the wire for the heading punch to hit the place where there will soon be a head. Having struck this initial blow, the heading punch recedes, to be followed by the partially headed end of the wire, which is again gripped and receives a second blow. Still another blow, and with an entire "head put on it" by the three successive blows, the next thing in order is for the cutting-off slide to cut off the unfinished pin, when the end of the wire again advances and another head is formed as before. In the meantime the unfinished pin has found its way into a groove in the periphery of an intermittently revolving disc, which delivers it to the care of two revolving screws, whose office it is to convey in each groove a pin to the pointing cutters, and after the point is formed to discharge them finished, into a receptacle beneath the entirely automatic machine, of which they constitute a part. As the conveying action of these screws, in combination with the endless belt, under which the column of pins pass, which, by its motion, communicates a rotary motion to the pins as they are carried forward over a bed occupying a position between, and parallel with, the screws, is one of the most simple but effective devices, it should, perhaps, be definitely described. The screw, which carries the body of the pin, has the bottom of its grooves at the same height of the top of the rest over which the pins are carried, and upon which they are revolved. The screw, whose grooves each carry a head, has its axis about on a level with the axis of the pin as it lies in a horizontal position, at right angles with the screws. In this manner the advancing equi-distant column of blanks are carried

forward by the revolving motion of the screws, and revolved by the action of the traversing endless belt over them, passing in their course under a succession of file-like cutters, which, by a rapid vibrating motion of several thousand strokes per minute—the filing motion being in the direction of the longitude of the pin, and at such an angle and curve as will produce the proper shape of point: the result is a perfectly concentric point. After leaving the last of the series of vibrating cutters, the now finished pin is dropped from the conducting screws at the rate of from 120 to 180 per minute. With pin manufactories by the score, each running scores of machines, the hourly production being counted in millions, is it not a wonder what becomes of the pins?

The Atlanta Exposition.

AMERICAN SILK—THE RAMIE PLANT—COTTON SEED.

Editor American Machinist:

The extent of territory suitable for silk culture is shown at the Cotton Exposition by samples of silk cocoons and reeled silk exhibited by contributors from nineteen different States.

The mulberry tree, which is the food of the silk worm, will grow wherever the apple can be raised, but the care of the silk worm can be carried on feasibly only in semi-tropical or tropical climates.

Silk culture is no novel innovation at the South; King James I, of England, sought to introduce the culture of the silk worm in Virginia, by sending silk-worm eggs and offering high bounties, but it did not meet with success Although some silk was made this industry was not permanently established. The robe which Charles II. of Enggland wore at his coronation, in 1660, was woven from Virginia silk.

In 1735, Queen Caroline wore a silk dress at the English Court.

In South Carolina, silk was raised at the period of the Revolution by both the Swiss and the French settlers in that State.

There have been a great many efforts to introduce silk culture in New England, but the severity of the climate offered many practical difficulties in the care of the silk worms. The writer has seen a hand-woven dress made in the mountains of North Carolina, which was hand-spun from a mixture of native silk and wool carded together. The climate of some portions of the South is in every way as well fitted for silk culture as that of France or Italy. There are about two hundred silk mills in this country in successful operation, and the product of their looms stands well at home, and a portion is exported to Europe, and there competes with the foreign product.

The raw material consumed by the mills comes principally from Marseilles and the Orient in skeins of reeled silk.

Each of the reelers of silk or filatures has his trade mark, which is packed with each bundle of silk. This would be an excellent plan for each cotton planter who raises cotton from good seed, gins and packs it carefully, and wishes to make a reputation for his crop, to pack a large placard in the center of each bale, giving his name and address.

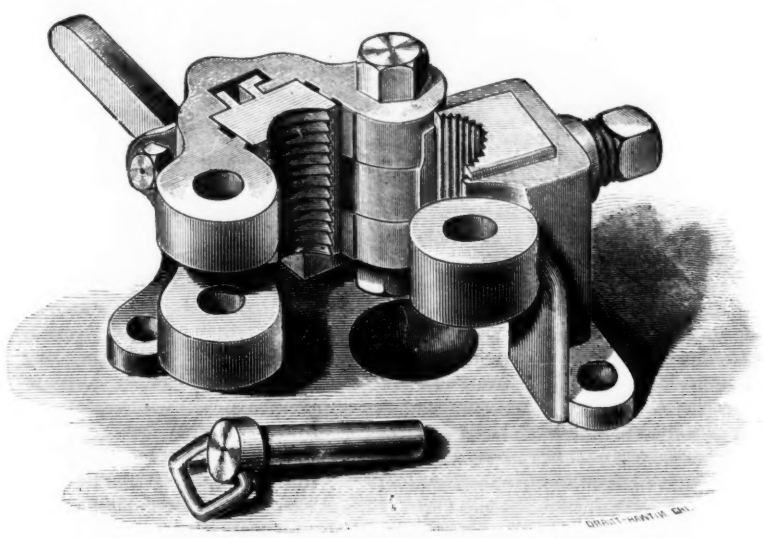
Annexed is one of the labels taken from a package of Chinese reeled silk, and given to me in a silk mill in Massachusetts. I was informed that this Chinaman could reel off silk better than he could the English language.

The reeling of silk from the cocoons is done by hand, with cheaper labor than exists in America.

The present silk culture is only a pleasant amateur occupation, and followed as a recreation by those who are not wage-workers and desire some light handiwork for leisure hours, but there is nothing in this work to be considered as manufacturing on a commercial scale. The reason that American silk is not raised in sufficient abundance to supply our mills, is purely a question of mechanics.

A machine to reel silk rapidly is the missing link needed to complete the development of the silk industry in America.

Inventors are busy with this task, and the successful one will have solved a problem as important to the silk interests as that of Arkwright's was to the cotton manufacture.



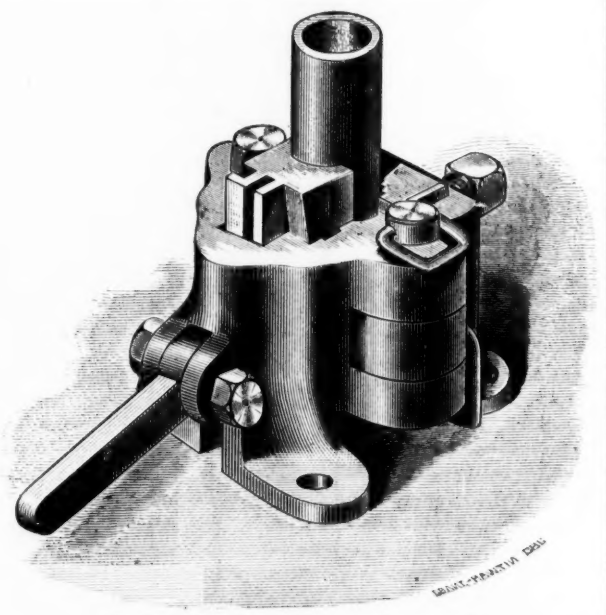
SAFETY CLAMP, OPEN.—See page 4.

The Women's Silk Culture Association are to give an American silk dress to Mrs. Garfield. The claim that it is the first American silk dress, in both culture and manufacture, is open to question.

In 1747, Governor Law, of Connecticut, wore a silk coat and stockings made from silk cocoons raised in that State; and in 1750, his daughter wore, what is considered to have been the first silk dress which was raised, spun, and woven in America.

The silk manufacture in America is well represented by the exhibit of Cheney Bros.

This wonderful firm, composed of a father and his seven sons, commenced the manufacture of sewing silks on a humble scale in 1837, and met many discouragements. They devoted all the resources of inventive skill to the prosecution of their business, and the result of their skill is shown in the large variety of silks which they exhibit.



SAFETY CLAMP, CLOSED.—See page 4.

There are plain dress silks, which are warranted all pure silk and not loaded with an excess of dye to add weight, and, therefore, will not crack or wear to that disagreeable gloss which is the fault of most silk goods.

There are also brocade or figured silks, surah or twilled silks, satins and plushes, and a large variety of ribbons, as well as miscellaneous goods, like spun silks, for use of other manufacturers, in making silk mixtures, stripes and checks in wollen cassimeres, in ladies' woolen or worsted goods, and in fancy articles like fringes. This firm have succeeded in manufacturing silk plushes for the first time that it has been done on a commercial scale in this country.

The great silk interests which have their manufactories at Paterson, are not represented at the Exposition. The Wortendyke Manufacturing Company of New Jersey, have an exhibit of silk handkerchiefs, and are weaving a further supply at their exhibit. The Women's Silk Culture Association of Philadelphia, and Wallace P. McKittrick, of Memphis, have exhibits of silk products, showing the silk worms in their various stages of existence and silk at each step, from the cocoon to manufactured goods.

Emerson defines a weed to be a plant whose virtues are unknown, but what term shall be applied to the Ramie plant, whose value is known, but not utilized? Ramie is a perennial, which grows in China and India. These nations have prepared ramie fiber from time immemorial, by scraping off the hard outside, and the fibers which are in the center are treated in some manner similar to flax. This prepared fiber is commercially known as "cosmos," and has a market value of ninety cents a pound, for adulterating silk. It is also used for making some peculiar oriental fabrics.

The preparation is done by cheap oriental labor, and the Indian Government of Great Britain has had a standing offer of a reward of $25,000, for the invention of a process to treat ramie by machinery.

Ramie grows throughout the South; some of it is growing in the experimental plots in the Exposition grounds. Richard Peters, of Calhoun, Georgia, shows some fine specimens of ramie in his agricultural exhibit. There are cases filled with the fiber, which is a dazzling, silvery white, similar to carded silk after the combing process.

There are ramie stalks with the outside removed and the fiber cleaned for half the length of the stalk. This preparation was done by a man in New Jersey.

Ramie is another Southern product which presents a need for the exercise of mechanical skill, in devising methods for its practical treatment on a commercial scale.

In most vocations, prosperity simply means that a man has saved those things which his competitors have wasted.

In a previous letter reference was made to the fact that the yield of the cotton plant was divided by the gin into two products, lint and seeds.

To turn the whole value of the seeds to profitable account, the farmer must have the assistance of the mechanic and the chemist, in devising machines and processes to deal with the successful utilization of much valuable matter which now goes to waste.

Cotton lint is, intrinsically, the least valuable portion of the plant, as its constituents are almost wholly taken from the air; less than 2 per cent. being mineral matter from the soil.

The seed weighs 2 to 2½ times as much as the lint, and its ash contains 36 per cent. potash, 36.2 per cent. phosphoric acid, 14.2 per cent. magnesia. The seed ginned from the 500 pounds of lint forming a bale of cotton, absorbed 40 to 50 pounds mineral matter from the soil, while the lint required only 8 pounds.

The weight of the upland cotton plant is as follows:

Lint	.088
Seed	.176
Bolls	.147
Leaves	.147
Stalk	.354
Root	.088
	1.000

The importance of returning the last four unmarketable portions of the plant back to the soil as a fertilizer, is an agricultural question not to be considered in this paper.

Cotton seed hulls are removed by a Kahnweiler huller, and furnish a good food for stock, except for fattening purposes, especially in combination with other food.

The kernels of the cotton seed yield about 25 per cent. of their weight in oil, when subjected to pressure. The oil is extracted by the first concussion, and no more oil can be forced out by subsequent pressure, however long continued.

On treating this dry oil cake with naphtha, a further supply of oil cake is obtained, to the extent of 12 per cent. of its weight, or 9 per cent. of the weight of the original kernels, increasing the total yield of oil from 25 to 34 per cent. of the weight of the kernels.

There are several methods of extracting the oil by naphtha, but the one considered the most efficient is, treating the kernels with the vapor of naphtha under pressure, and condensing the product, then blowing steam through the oil to discharge the naphtha.

8,000 bushels of flax seed are so treated at Cleveland, daily.

If the oil is to be made for table use, it is desirable that the naphtha should be free from any mixture of the heavier products of petroleum, as they are difficult of removal, and give to the oil a disagreeable, pungent taste. On a laboratory scale, the writer has found

HUNG YU SILK HONG.

YUEKEE CHOP.

BY SELECTING

Best No. 1, Fine re-reeled

TSATLEE SILK.

When obliged to Merchants bestowing their regards, please to notice carefully of our sign, are without mistaken. This chop is by self-reeled true Tsatlee Thrown Silk.

that fractional condensation has been a better means of separating these heavy oils from naphtha, than by fractional distillation.

The naphtha used for extracting the oil can be used over again an indefinite number of times, with but slight losses.

This method of treatment is rather crude at present, but it promises to ultimately become the only commercial method of extracting animal and vegetable oils.

The uses of cotton-seed oil are increasing as it becomes better known. The latest use to which it has been put is the making of artificial butter, in which respect it is certainly preferable to oleomargarine made from suet or lard butter.

A large quantity is used in this country to adulterate lard oil, and also exported to adulterate olive oil. It is used as a substitute for olive oil for table use, and also for culinary purposes in place of lard and of butter ; it is used for tempering ; soap is made of it (*savon blanc à froid*).

This oil is rather dangerous for use in the industrial arts, on account of its tendency to spontaneous combustion when smeared on waste or rags. It is of no value as a lubricant, as it gums badly.

The utilization of cotton seed has been carried on on a limited scale until lately, and at the present time the greater part of it is wasted.

C. J. H. WOODBURY.

Atlanta, Ga.

Long-Legged No. 10.

Much has been said about Long-Legged No. 10, or Class K engine, upon the Pennsylvania Railroad, as being an excellent specimen of the perfection of modern locomotives.

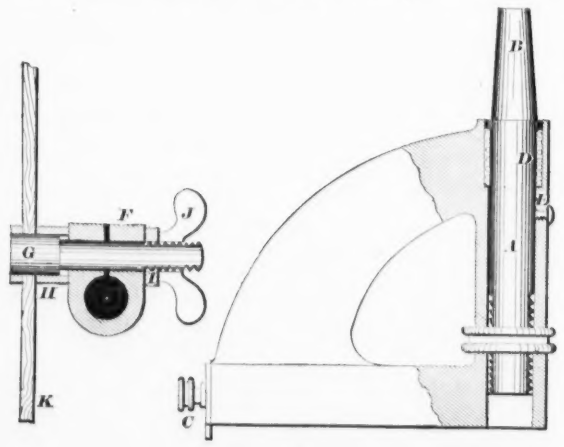
We admit that engines of this class are good specimens of the skill of designers and mechanics, but they do not come up to the high standard which was expected of them. With their large driving wheels 6′ 6″ in diameter, they lose a great deal of time in starting out of stations, and can only make time on long runs with no stops. The extremely shallow fire box prevents working a fire of sufficient depth for economy, and furnishing the required quantity of steam to make time with a train. There is room for great improvements in locomotives, when the attempt is made to build passenger engines much larger than the average or standard sizes now in use, and the new ground occupied is found to be mostly experimental. One very important improvement that might be made in the class *K* engines would be to adopt the Allen valve (which is now common property), properly balanced. Such a combination makes what we consider one of the quickest and most desirable valve motions for locomotives.

LETTERS FROM PRACTICAL MEN.

A New Surface Gauge.

Editor American Machinist:

As the surface gauge is again in order, allow me to describe a gauge I designed and



SURFACE GAUGE.

constructed about six months ago, and have had in use ever since with excellent results.

As it is on the general principle of the "Starrett" gauge, recently illustrated in the AMERICAN MACHINIST, I am prompted to describe it. I think it is arranged differently in several respects from any that has ever come under my observation.

The points I desire to call attention to particularly are, the hollow movable spindle, the adjustable projection at *C*, and the manner of securing the clip and scriber by operating a single nut.

The short spindle *A*, is solid, being slightly tapered at its upper end *B*, to receive the spindle proper, which is in my case a piece of ½″ seamless brass tubing, the hole being slightly tapered and ground to fit at *B*.

The advantage of this plan is that it admits of varying lengths of spindle being used according to the nature of the work. The spindle is easily and quickly removed.

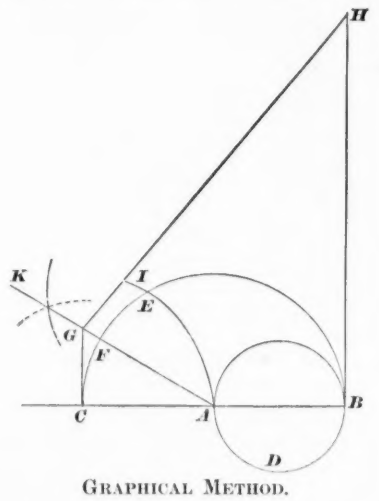
It being hollow, secures great lightness at the top, and throws the weight to the base, where it is needed to secure the best results. It is also more convenient to pack with the spindle removed.

At *D*, is a spring designed to take up lost motion from wear, which may or may not be necessary. At *E* is a small pin, working in a groove in the short spindle, to prevent its turning.

The base is square, being 2½″ wide by 3½″ long, and is recessed at the back to within ⅛″ of each side to receive a thin plate held in place by a milled thumb screw. The hole in the plate is elongated,, so that when the screw is released the plate will drop down ⅛″ or $\frac{3}{16}$″ below the bottom of the gauge, forming a shoulder, and when not in use can be raised and held in place out of the way. The sketch shows the plate down.

I find this little device of great value in setting work parallel with the bed of the machine, without the necessity of running the work back and forth to try it with a pointer secured to the tool block.

The spring clip *F*, is after the old style, but, I think, cannot be improved upon. I have arranged the manner of holding the scriber differently, which is simple in con-



GRAPHICAL METHOD.

struction, gives a broad bearing, and holds firmly. At *G*, the bolt is slightly enlarged, so as not to be too weak after boring the hole for the scriber. Over *G*, is a collar *H*, extending $\frac{1}{16}$″ beyond the under side of the head, and flush in front. In this position the hole for the scriber is bored through collar and bolt. At *I*, is a washer, the whole operated by the thumb nut *J*. *K* represents the scriber broken off at the ends. I prefer a square base with the spindle thrown to one side, as it is often necessary to get very close to the work.

J. J. NEWBAKER.

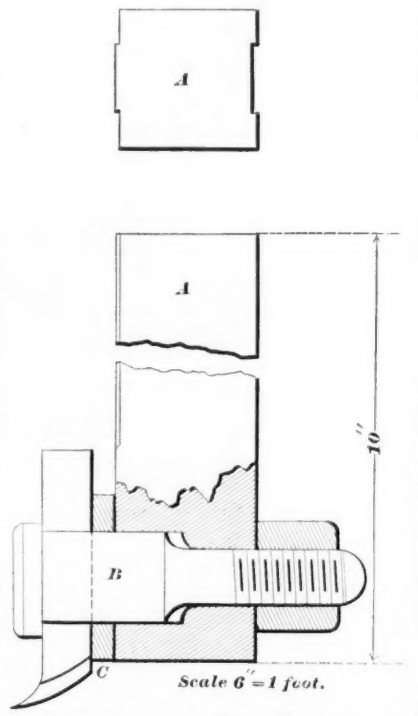
Steelton, Pa.

Graphical Method of Finding the Circumference of a Circle.

Ed. American Machinist:

I noticed in the issue of the AMERICAN MACHINIST of July 2d, 1881, a graphical method of finding the circumference of a circle from its diameter, by C. A. Smith, of Bay City, Mich. The following construction for the same purpose will be found more accurate, may be easily remembered, and does not require a line five feet two inches long to be drawn. It may be of interest to some of your readers, if you think it worth while to publish it.

Let *A D B* be the given circle. Draw the diameter *A B*, and prolong it indefinitely. Lay off *A C* = *A B*, and from *A*, as a center,



A COMBINATION TOOL HOLDER.

describe the semi-circle *C E B*; from *C*, as a center, and with a radius *C A*, describe the arc *A I*, cutting the semi-circle *C E B*, in *E*. Bisect the arc *C E*, in *F*, and draw the indefinite line *A K*. At the end *B*, of the line *A B*, erect the perpendicular *B H* = 3 *A B*, and from *C* erect the perpendicular *C G*, intersecting *A K* in *G*. Draw the line *G H*. Then will *G H* be equal to the circumference of the circle *A D B*—or to the semi-circumference *C E B*—very approximately.

For the benefit of those who wish a mathematical demonstration, the following is appended :

Let the diameter of the given circle = *A B* = 1. Then *G H* =

$$\sqrt{2\ AB^2 + (3\ AB - \tan.\ 30^\circ)^2} = \sqrt{2^2 + 2.42265^2} = 3.141533,$$

or very approximately equal to π *A B* = circumference of circle whose diameter is *A B*, being too small by about .000059—which is entirely inappreciable in practice. It must be borne in mind to have graphical methods of use, very fine lines must be used, and care taken in the location of the intersections. The rule may appear complex, but it is very simple in practice and easy to be remembered.

C. J. MATTISON, C. E.

Albany, N. Y.

job that puzzles the machinist with the facilities at hand.

I have been interested in noting what, for a better name, might be called the combination tools, presented from time to time by the correspondents of the AMERICAN MACHINIST; and, in the hopes of adding something to the general knowledge, present, in the engravings which accompany this, a tool which can't be described as new, since the one from which the illustrative sketch was made has been in use for not less than ten years, but which, for all that, may be new to a good many of the readers of this.

So far as the writer knows, it is original with George W. Richardson, the sketch being made from one in his shop.

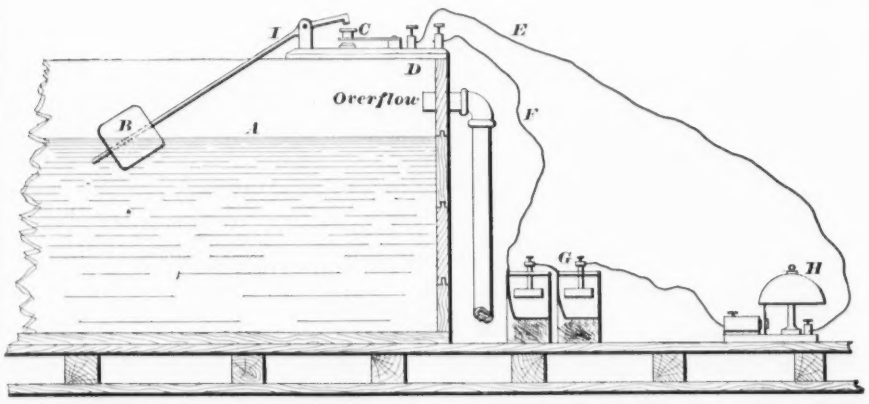
In the engraving, *A* is the tool holder, which may be made of wrought iron, but will be better if made of steel, as this one was. It should be slightly grooved on the back, where it comes in contact with the jaws of the tool slide, for the purpose of making certain its bearing at the outer edges; and, for the purpose of bringing the binders against the front surface along its center longitudinally, that surface should be the highest down the center, as shown in plan at *B*. This causes it to seat firmly, without any inclination to rock when in use. (In this connection, although a digression, it may nevertheless be proper to allude to the common practice of using a tool in the lathe or planer just as forged, and often with the surface in contact with the slide $\frac{1}{32}$″ rounding, as not giving the tool a fair chance.) The binding bolt *D*, which is mortised to receive the small tool, (in this instance made from ½″ square steel), should fit nicely, or the enlarged portion of it, in the hole made to receive it in the holder *A*, but yet be loose enough to turn around quite easily.

C is a steel collar, used mainly to preserve the face of the holder, and which may be roughened on its outer surface and hardened. Further than this, the construction is apparent from an examination of the sketch.

The advantages of this tool are, first, the one common to all tools of this class—that of using small cutting tools that are quickly and readily made, removed, ground, etc.; and, second, the ease with which the binding bolt may be loosened, turned and clamped with the tool in position to cut at the top, bottom, either side, or at any point intermediate, while, at the same time, there is no set screw to protrude ahead of the tool to get broken against some obstruction, or to be in the way when planing up to a shoulder.

This will be appreciated by any one accustomed to the use of a planer, since it enables a single, small cutting tool to be used in the holder to cut in any position, not only in many instances saving the use of a large number of tools, but enabling the operator to come at difficult places with comparative readiness.

While the advantages of a tool of this



ELECTRIC TANK INDICATOR.—See Page 7.

A Combination Tool Holder.

Editor American Machinist :

In the machine shop of moderate size the providing of a full set of planer tools is often felt to be a heavy expense—so heavy, in fact, that in many instances tools are modeled over to suit different jobs, or different parts of the same job, of course at considerable inconvenience and expense in the way of time; and not only this, but, in cases where a blacksmith is not at hand, it often proves a class have been referred to a small shop, where a planer is not, perhaps, in constant use, it is the belief of the writer that they may be advantageously used in any shop, and up to sizes two or three times as large as here represented, particularly since the small weight of the cutting tool removes, to a great extent, the objection to the use of special high-priced brands of steel.

When a tool of this kind is required for planing work that will not pass between the

planer uprights, provision for which has frequently to be made, the end is extended, as at right angles, from *C* to the distance required, and the tool fitted up in all other respects as the one shown. H. F. F.

Electric Tank Indicator.

Editor American Machinist:

Where a tank is located upon the top of a large building, for furnishing a supply of water to the different apartments, and the engine room, where the pump is located for supplying the tank, is about three or four hundred feet away or across the street, it becomes a somewhat difficult matter to convey to the engineer a knowledge of the height of the water in the tank. To run a tell-tale pipe from the tank to the engine room is hardly practicable, and it is liable to become stopped or to freeze up in winter. A float and cord is hardly the thing.

The illustration on page 6, shows a very simple apparatus, which a friend of mine, W. J. M. Dobson, designed and applied to the water tank for supplying several large buildings in this city, furnished with steam power, of which he is the chief engineer. The tank *A* is made of wood and has an overflow pipe to prevent the tank from running over. A very common key board, such as are used in making and breaking electric connections, having a key *C* and two binding posts, is screwed fast upon top of the tank. From one of the binding posts a wire *F* connects with two cells *G*, of the simplest form of gravity battery, which is probably the most durable and requires the least care of any for this purpose.

An electric bell *H* is placed upon a small shelf at a convenient locality in the engine room, and is connected by one wire with the battery *G*, and to the other binding post in the key board by the wire *E*. These wires are, of course, covered with insulating material, as usual for such purposes.

Water, being pumped into the tank, raises the cork float *B*, which tips the pivoted lever *I*, until the end presses the bottom *C* upon the key board, thus making a circuit between the bell and battery, which causes the former to ring until the float falls and breaks the circuit. The float *B* can be set at any position upon the lever *I*.

In pumping into tanks, it is always best to connect the feed pipe with the bottom of the tank, and pump against the head of water in the tank. Thus, advantage is taken of the varying height of head; whereas, if the pipe passes over the top of the tank and the tank is nearly empty, the pump has to pump against the same head as when the tank is full.

A pump works better and more economically when the pipe is connected at the bottom of the tank than where it passes over the top. This may not be new to some, but I am persuaded that the majority may be benefited by using the electric indicator, as herein described. F. LEWIS.

New York City.

Fine or Coarse Toothed Rotary Cutters.

Editor American Machinist:

I notice in your issue of December 17th another of Chordal's "traps" to catch the unwary. He seems to prove that, contrary to "theory," the coarse-milling tool excels the finer in quantity of work done, and runs this principle down to a shaping machine, or a circular saw, with but two teeth.

This will doubtless bring out the *fine* and the *coarse*, until we shall be fully informed on the subject.

Not wishing to come in at the last with "I told you so," I will simply indicate now my views on the subject, by saying that if I had a gear cutter *proportioned to its work* I would not exchange it for a shaping machine, notwithstanding Chordal makes the latter do three times as much work as the former.

I would as soon expect to make an old style sash saw mill do the work of a modern circular saw mill. QUIRK.

Chattanooga, Tenn.

The New York Central and Hudson River Railroad owns and operates about 2500 miles of track, or more than any other railroad in the world.

New Portable Fret Sawing Machine.

This machine is made from entirely new designs, and with a view to avoiding many of the difficulties experienced in the use of the ordinary suspension, or "clear-sweep," scroll saw. It is a fact that a large proportion of all the curved sawing that is done is within the compass of an ordinary band-saw arch, and it is for work of this kind that the portable machine illustrated herewith is especially adapted.

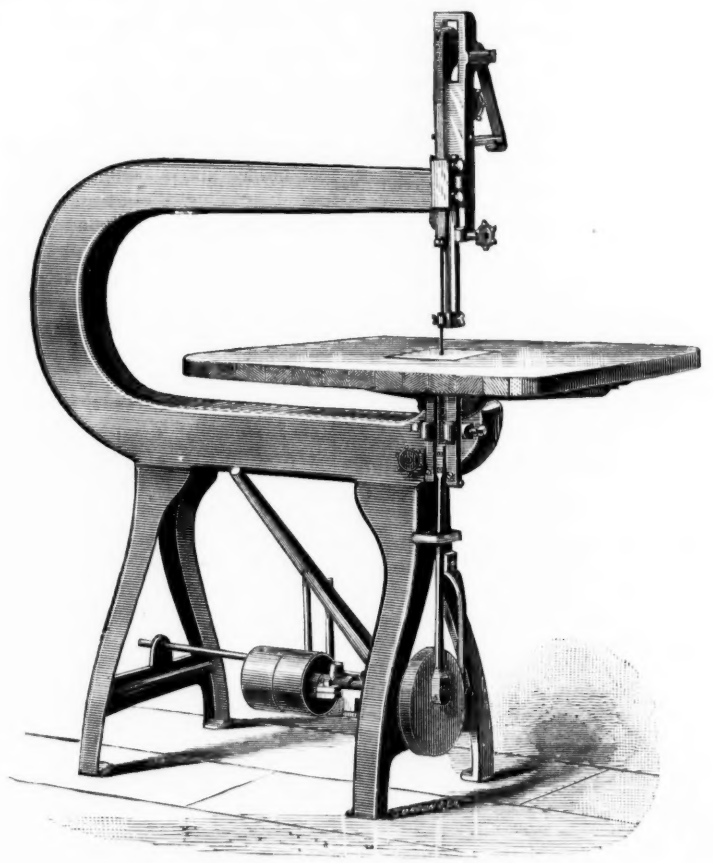
The arch is cast in one piece in tubular form, and is sufficiently strong to sustain the saw rigidly against its work, and to resist the vibration caused by the action of the strain.

The table is of kiln-dried hard wood, firmly secured to a heavy tilting bar, so as to be adjusted for bevel sawing.

The vibrating parts are of steel and wood, and, while amply strong for the work, are extremely light, admitting of a high speed, without special foundations for the machine.

The strain is of steel, and is so designed that an even tension is maintained on the blade throughout the stroke, while friction and wear are reduced to a minimum.

The crank plate is balanced for the pitman, according to best known methods, and



PORTABLE FRET SAWING MACHINE.

a combined brake and shifter is attached, by which the machine may be stopped almost instantly. Hardened steel guides are provided, both above and below the table, for the purpose of holding the blade rigidly in its track.

The shaft is of steel, and runs in connected bearings of good Babbitt metal, and the loose pulley is self-oiling, and has an extra long hub.

The lower slide ways have rake adjustment, and the upper guide has adjustments in every direction; ample provision is made for oiling all the working parts.

Careful attention seems to have been paid, in designing this machine, to attain the desirable qualities of a good high-speed jig saw, while avoiding many well-known faults.

The No. 1 size has 4 inch stroke, saws 5 inches deep, and to the center of 84 inches. The pulleys are 6 inches in diameter, and may run 1200 to 1300 per minute.

No. 2 has 5-inch stroke, saws 8 inches deep, and to the center of 100 inches. The pulleys are six inches diameter and three inches face, and may run 1,100 to 1,200 per minute.

These machines are built by Frank H. Clement, 122 to 126 Mill Street, Rochester, N. Y.

Test of the Edison Electric Light.

Mr. John W. Howell, of the class of 1881 at the Stevens Institute of Technology, Hoboken, N. J., during the year made tests of the Edison electric light, with a view of estimating its commercial or economic value as an illuminator, as determined by the energy consumed and the amount of light produced. The tests were very carefully made, the most delicate dynamometers and galvanometers being used. The calorimeter was also employed in determining the quantity of heat developed by the current. The generator used was one of the special machines made by Mr. Edison, and was peculiar for its low resistance, though producing an immense quantity of electric energy for the power required to drive it. The lamps tested were five of those made by Mr. Edison, and known as sixteen candle power. The shape of the carbonized loop is now made, so that the light appears at a glance to be evenly distributed, except a slight shadow in a line with both parts of the carbon.

The measurements of candle power were made by a photometer. According to Mr. Howell, the proper angle of illumination appears to be at an angle of 65°, with a line drawn through the center of both parts of the carbon.

To make this clearer, suppose we strike a circle around the lamp, and draw a line through the center of both parts of the carbon, which represents zero. The circle is then to be divided into four parts of 90° each; then the point upon the circle where the light is most intense will be at an angle of 65° with the zero line.

All measurements of lamps tested were made at the angle of equal illumination. To determine the economy of an Edison lamp at different degrees of incandescence, measurements were taken at intensities ranging from a dull red up to 40 candle power.

The results showed a rapid rise in economy as the candle power increases. While the economy of an electric lamp increases with incandescence, its life shortens. Data to show the relative life of electric lamps at different degrees of incandescence have not been fully worked up yet. The object of Mr. Edison has been to produce a lamp of 16 candle power, which would give good economy, and have as long a life as possible, while giving the amount of light named. The results of tests of the five lamps, burning at their normal brilliancy, are shown in the following table:

Lamps, No.	Candle Power.	Volts.	Ohms.	Foot-pounds of electricity per minute.
1	16	98.66	135.5	3178—03
2	16	98.66	142.5	3021—91
3	16	99.	140.5	3107—41
4	16	98.	148.5	2861—15
5	16	99.33	131.5	3319—32

These results show an average of 3,097—564 foot pounds of electricity per minute, or 10.65 lamps per horse power of electricity, which give 170 candle power per horse power.

Mr. Edison claims to get a result of 10.65 lamps per horse power of electricity, but as he allows a loss of ten per cent of the electrical energy upon the conductors, he gets 9.68 lamps for each horse power of electricity generated.

The average commercial efficiency of his generator is said to be .887, which would give him 8.58 lamps per dynamometrical horse power. Taking the results of a test of three modern stationary steam engines, showing .878 of the indicated power converted into useful work, as a factor for the conversion of power shown by the dynamometer into indicated horse power, we find that Mr. Edison gets—according to Mr. Howell's tests—7.62 lamps of 16 candles per indicated horse power.

A Machine Tool Query.

Suppose all the lathe-using establishments in the country should simultaneously conclude that they need a twenty-inch lathe: How long would it take all the machine tool manufacturing establishments in the country, working together and doing nothing else, to supply the demand thus created?

The Louisiana State University proposes to add to the practicality of its course by the establishment of an experimental sugar laboratory.

Hollow steel shafting is made by casting the metal around a core of lime, the ingot being finally rolled into shafting, the lime core going with it, and diminishing in diameter in the same proportion as the metal, even when the total diameter is reduced as low as one-fourth of an inch.

The following, which we clip from the *English Mechanic and World of Science*, probably refers to wrought metal pipes:

With the view of avoiding the bursting of water pipes by freezing, a method of making them elliptical in section has been recently patented. As the water expands to form ice, it will alter the shape of the pipe, causing it to become circular in section, and therefore giving more room for the ice. It is proposed to squeeze the pipes into their original shape, when, by a succession of frosts they have been rounded.

An Englishman has invented a new explosive called "dynamoge," which is said to be much superior to powder. We have in this country an explosive (not of very recent invention) which, combined with the implement for its discharge, is called demagogue. The force is derived from compressed gas. The weapon is usually of very small caliber; can be charged so as to be used continuously for days at a stretch, and is terrible in its destructiveness.—*Detroit Free Press.*

There are nearly 18,000 locomotives in use in the United States. Of these 2,700 are in the State of Pennsylvania, New York coming next with 2,000. Illinois has 1,900; Georgia and Virginia 300 each; and Florida, 30. The Middle States have 6,000; the Western, 7,800; New England, 1,700; the Southern, 1,800; and the Pacific States, 420.

A company in Paris is trying the distribution of power for small workshops and for household purposes, by means of vacuum. It has already constructed the service for about 700 yards, and is providing with power several small workshops. A powerful engine with air pumps makes a vacuum of about three-quarters of an atmosphere, with which the motors are connected.

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NEW YORK, JANUARY 14, 1882.

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The Steam Engine Versus Water Power.

One result of bringing the steam engine to its present state of efficiency is its effect in determining the locating of extensive manufacturing and industrial establishments without reference to water power. The proverbial water wheel, that years ago was inseparably connected with all thoughts of the millstone, has given place to the high-speeded or ponderous fly wheel, that forms a part of the equipment of the modern and model flouring mill, and here, as everywhere, the certain power of the steam engine, that never fails on account of dry weather, is crowding out the water wheel with its uncertain tenure of power.

At first thought it would seem that water power would give its possessor an advantage in the quality of cheapness that could not be overcome, but in point of fact this advantage is much more apparent than real.

In the first place, the steam engine has one great advantage, that will, in many instances, outweigh all considerations of the difference in the cost of running expenses, which is, that it allows of the best attainable location; while, where a water wheel is the motor, the location is not only geographically, but generally locally an enforced one. This will frequently entail expenses in the way of transportation and from a general unhandiness, that will make the water power expensive if it costs nothing; which, however, is by no means the case. On the contrary, the utilization of an extensive water power is usually a matter of a heavy—frequently an enormous—expense; the interest of which would go a long way towards the coal account of the steam engine.

Again, the certainty of the definite power of the steam engine, as compared with the uncertainty of the water power, is frequently a sufficient argument in favor of the former; and in this respect it is noticeable, that while the steam engine has been and is improving, the water power—from loss of forests and other equalizing causes—is retrograding. To such an extent is this true that the water powers of the country, that can be depended upon as at all times ample, may be counted on the fingers.

Another thing that is having its effect in the substitution of steam for water power, is the marked difference in the manner of conducting industrial enterprises, as compared with even a few years ago. The old-time plan was when the water was out of the pond for the boys to go fishing till it filled up again, but under the pressure of now-a-days this plan will not do. Manufacturing, to be successful, even on a small scale, must be carried on by the help of costly machines and machinery, and the money invested makes it necessary that there shall be the least possible interruption from enforced idleness.

Notwithstanding the noticeable progress already made in the direction of stable power, it is a fact that there are yet hundreds of small manufacturing enterprises, situated in remote localities, where transportation is expensive, and all for the purpose of getting some sort of water power for about two-thirds of the year, which would be vastly benefitted by establishing themselves nearer market or lines of transportation, and using steam power. This is being appreciated, however, more and more, and to-day, as a rule, those starting in such enterprises, instead of, as formerly, looking for a location to which people won't go, but which has some sort of a water power that is to be improved by storage reservoirs, that breed pestilence and get dry in the summer, look for a location best suited to their business, and drive their machinery with a modern steam engine.

The present economy and the progress towards indestructibility of the steam engine, together with its perfection of regulation, are fast bringing it into prominence as the greatest and *cheapest* prime mover.

The following item is going the rounds of our exchanges:

A New York City man has invented a sensitive steam engine governor, which, it is claimed, will operate when additional work is thrown on the engine to instantly open the valves for the admission of a corresponding head of steam into the steam cylinders, and so avoid the slacking down of the engine, usual at such a time.

This is all right for the New York party, and, we trust, expresses just what his governor will do; but will some one tell us how this differs from the usual operation of a good throttling governor?

Why Use Steam Reverse Gear?

Within the past year steam reverse gears have been introduced and used upon locomotives more extensively than ever before. Why? Because the engineers complain that they nearly break their backs in handling their engines. This proves that there is something radically wrong in the design and construction of slide valve gear in ordinary use. The time was when the engineer could sit upon his box in the cab and throw the lever to any position without rising from his seat; now he not only has to stand up, but is required to get a good brace with his foot against the boiler head, or some other convenient place, and pull with all his might, using both hands.

This is not as it should be, and there can be no reasonable excuse made for difficulties of this sort. A locomotive valve motion should be so constructed that the lever may be moved with the strength of one hand to any position, when the engine is at work in hauling a heavy train. This improvement can be, has and is being accomplished without increasing the complication of parts, while their durability is more than trebly increased. It is, perhaps, unnecessary to add that the locomotive is thus made smarter, and works with a much greater economy.

In most of the locomotives built at the present time, the sizes of the ports have been greatly enlarged, in some instances double their former size. This, in addition to the increased boiler pressure, compels each slide valve to carry the enormous load of from six to seven and one-quarter tons. As a result of this load, the eccentric straps heat, the pins and link blocks wear away very rapidly, and the valve seats become worn in a few weeks, so as to leak very badly.

Furthermore, the valves cannot be kept exactly square more than three days at a time, and to overcome all these difficulties the steam reverse gear has been introduced. We are fully convinced that this is beginning in the wrong way and in the wrong place, to cure the evils existing. The proper way would be to take all, except one ton of load, from each valve, that pressure being ample to keep the valve upon its seat under all contingencies. This may be, and has been done by a simple and durable balancing device.

One reason why it has not been done in many instances has been, because so very many of the balancing devices for slide valves tried, have been too complicated for the purpose. After trying a number, master mechanics have become disgusted with all of them, and preferred to

> "bear the ills they have,
> Than fly to others that they know not of."

Past experiences, however, should not discourage, for there are valves in use which can be relied upon to accomplish the needed results.

The Blacksmith as an Artist.

Probably less is said and written of the art of blacksmithing than of any other of the processes of iron-working, and yet there is not one of these processes that requires more of the skill of the artist to satisfactorily follow. The ability to properly heat and hammer, weld and forge, together with the judgment to quickly discern the slight variations in the nature and quality of the metal he works, and to adapt his practice to the requirements of each peculiar piece, according to it the proper treatment to obtain the best results; in a word, the numerous—almost numberless—*kinks* of the trade requiring rare judgment and the closest observation, constitute only one branch of the education of the skilled blacksmith.

The education of the eye is another of these branches, and in considering this we begin to get into the realm of what constitutes the real skill of the blacksmith. Where other mechanics measure with the rule or the calipers, he measures with the eye;—not that he does not, to a certain extent, measure with tools, but that it is not practicable for him to make any such use of measuring instruments as is made by most other mechanics.

But the crowning feature of the blacksmith's education, and that which, with the education of the eye, makes him particularly the artist of the brotherhood of iron workers is, strange as it may appear at first thought, the education of the imagination. In looking at a fine specimen of forging—something involving considerable complication—the first thought, naturally, is of the skill and manual dexterity necessary to produce it. It would be quite wrong, however, to conclude that this is all there is of it. Before the mechanical skill of getting the matter into this shape, is the ability to imagine the shape; to see in the "mind's eye," and from a consideration of, perhaps, a rough figured sketch, a scale drawing, or at best, a representation that is in hardly any sense what he must really see—to see from this, in his imagination, the ultimate finished production. Not only must he see it, but he must resolve the complication of artistic forms into the inartistic piece of iron, that shall be just sufficient when hammered, and bent, and twisted, and drawn, and upset, and split, to form it. Here the work of the artist begins, and in every change, incident to each special manipulation, he must see in his imagination each of these progressive forms clearly defined.

In none of the industrial mechanical operations are the mental and manual processes more clearly defined than in the instance of the blacksmith, and while a thorough understanding of the latter is absolutely essential, a high degree of acquirement in the former is quite as necessary to the reaching of that degree of perfection characterizing the really skilled operator. The ideal blacksmith may not be a fellow of "infinite zest," but he must be a man of infinite imagination, and it is no wonder that in ancient times he ranked high among artificers.

However modifications of science may be brought to bear to limit the application of his knowledge, so long as iron is used in the industrial arts this knowledge will continue to be in demand, and the skilled blacksmith will continue to rank amongst mechanics as an artist.

Commencing with volume five, 1882, we adopt the plan of numbering the Questions and Answers in that department of the AMERICAN MACHINIST, consecutively, from one upwards. We do this, so that at the end of the year we may be able to classify and index them in such a way that our readers may, by the aid of the index, readily refer to them under properly classified subjects and numbers.

Can Shops Be Too Large?

In times of active business the chronicler of shop enlargements is sometimes led to ask himself if a shop may not be too large. When orders are piling up beyond the possibility of filling with present facilities, the shopowner is sometimes led to enlarge his works in the matter of area, when the necessary expansion could have been better gained by adopting improved tools. The vice of farming in America is trying to cultivate too many acres at the expense of careful tillage. The vice of a good many machine shops is an excess of plant, expenses and taxes, and too little real system.

When one thinks of shops like those of Krupp, in Germany, one is liable to conclude that a shop cannot be too large. Probably such a shop cannot be. But how many shop proprietors have the Krupp talent for organization?

Military history is full of examples showing that while there are many men who are

able to handle a regiment successfully, and a respectable number who can direct a brigade or division, the number is small indeed, of those who can handle the great masses of men whom modern warfare calls into the field. The shop proprietor, who is led to canvass the subject of enlarged facilities, while he is canvassing the other questions involved, as to prospective business, etc., should also inventory the executive skill that himself and his associates possess, or can command.

Evening Occupation for Apprentices.

One of the most profitable things that apprentices and young mechanics can do to employ their time in the evening is to construct some inexpensive models for illustrating the movements of different kinds of machinery.

For instance, an eccentric and crank are easily made, which by properly mounting upon a board, will show at a glance the movements of a slide valve. Two small pulleys crowned, and about 12 inches of shafting in each one, hung in a frame, so that they may be adjusted in different positions with a belt upon them, will give better ideas and more information concerning the running conditions of belts than years of work in the shop. By means of these simple models, conditions and complications may be introduced and solved, which would, perhaps, not occur more than once in a lifetime.

Trial Trips of the New Compressed Air Locomotive.

The new compressed air locomotive, which was illustrated and described with details in the AMERICAN MACHINIST of December 10 and 24, 1881, has been making frequent trial trips upon the elevated railroad in this city, each trial proving more successful than those preceding it. It is thought that the existing mechanical difficulties will be successfully met and overcome, so that the experiment, as a whole, may prove entirely satisfactory. The inventor claims that a number of compressed air locomotives can be built much cheaper than ordinary locomotives, while the running expenses would be about 50 per cent. less.

The acceptance of the Herreshoff vedette boats and pinnaces by the English naval authorities, after exhaustive comparative tests with the best English-built boats, is satisfactory as an evidence that there is still left in the United States some knowledge of shipbuilding. According to published accounts, the Herreshoff boats were credited with being superior in speed, floatation, maneuvering, behavior in rough water, &c.

Shop Bookkeeping.

In getting out the details of mechanical work, the rule of thumb can often be made to apply to some advantage. In conducting the financial part of any business, manufacturing or commercial, the rule of thumb is usually the rule of memory or guess, and very unsatisfactory. The shop proprietor, for example, who is conducting, say, a machine shop, foundry, pattern, blacksmith and boiler shop, may be making a profit out of one or two of these branches, while the others are run at a loss. Such a proprietor could investigate the desirability of a little bookkeeping to advantage. A bookkeeping system, which would show at any time during the year just how much money had gone into and come out of each department, need not be very complicated, and would be likely to prove remunerative.

As a result of the establishment of such a system, the non-paying branches would, in the case of many shops, either be reorganized or discontinued. A further result would often involve such an intelligent understanding of the cost of products and demands of competition as would lead to profitable reorganization of the paying parts of the business.

Railway Engineering.

Apparently an anomaly in railway engineering is that, while every effort is being made to increase the speed of passenger trains, by improving road beds, using steel rails, and especially by introducing improvements in locomotive construction, the weight of passenger coaches seems to have been systematically increased, until, on a fast train of Pullman cars, the dead weight, exclusive of baggage and baggage cars, will probably exceed 400 pounds for each passenger carried. This seems, and is, an enormous weight to carry, and must result in carrying few passengers at high rates on fast trains, or the use of cars in some way made much lighter than those now in use. With the present knowledge of the use of steel for structural purposes, where strength and lightness are desirable, it would seem that a passenger coach, having all the conveniences of the modern ponderous affair, might be constructed of not more than half its weight.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(13) H. J. R., Smithville, N. J., asks: If, in making shrinking fits, as wrought iron in cast iron, the head into which the wrought iron is shrunk should be cooled by plunging into cold water? *A.* Under ordinary circumstances, No.

(14) C. N. R., Champaign, Ill., asks for some news in reference to the Shaw locomotive. *A.* An illustrated description of this locomotive appeared in the AMERICAN MACHINIST of June 18, 1881. There was also some reference made to it in our last issue by Wm. Barnet Le Van.

(15) G. W., Chester, Pa., writes: I have had several arguments with my friend in reference to the operation of a propeller wheel. I claim that the water which the wheel works in is a nut. He says not. Which is right? *A.* In discussing the operation of the propeller wheel, it is quite customary to consider, as you do, the water as the nut in which the screw works.

(16) G. W., Bradford, Pa., writes: Some time since I had occasion to make a double-threaded nut and screw. I divided the thread on the screw without trouble, but had trouble in dividing the nut. How can it be done? *A.* The plan usually employed is to divide and mark two of the screw gears, stop the lathe, slip them out of gear, and turn the spindle one-half or one-third, as it may be a double or triple thread, putting them in gear again by the marks.

(17) J. J. B., Knoxville, Tenn., asks: 1. Will you give me the best mixture for car brasses? *A.* Opinions always have differed—probably always will differ on this subject. One mixture is two ounces of tin to one pound of copper; others a little more or less tin, and sometimes a little zinc. 2. Is there a machine made purposely to bore such brasses? *A.* Not that we are aware of. 3. How is phosphor bronze made? *A.* By the addition of a small percentage of phosphorus to bronze alloy.

(18) R. S., Eau Claire, Wis., writes: I am running a pair of twin engines, 16″x20″, at 165 revolutions. Steam pipe is 5″ in diameter and 53 feet long, with two right-angle bends; Allen governor. What I want to know is, if this steam pipe is large enough? *A.* You do not give sufficient particulars. We suppose you use a throttling governor and lap valve. If you get your power easily from the engines, the pipe is as good as a larger one. If not, that is, if the engines are overloaded, you will do better with a pipe not less than 6″ in diameter.

(19) N. Y. C., New York, asks: Will you please inform me how to find the pitch of a screw, when the diameter and number of blades are given? *A.* The diameter and number of blades of a screw propeller have nothing to do with the pitch. If you take an ordinary single thread machine screw, and measure the distance apart of two contiguous threads, that distance is the pitch. To measure the pitch of a propeller screw, treat it the same as a machine screw; that is, conceive one blade to be large enough to represent an entire revolution, and determine what distance it would measure in a line with the shaft. This distance is the pitch.

(20) Apprentice Boy, Philadelphia, Pa., writes: I am an apprentice boy in the machine shop of a large shipbuilding establishment, and several of us are about to organize a club which apprentices of any shop can join. It will include draughtsmen, machinists, pattern makers, and, in fact, all trades having to do with the marine engine. The idea is to meet together for study, reading and discussion for mutual improvement. What do you think of the idea, and would you suggest a name? *A.* We think the plan a most excellent one, and advise you by all means to persevere. If you mean business, we venture to say you will find it the best investment of time and a little money you will ever make. As to the name, we suggest that you show your determination to do something by selecting one for yourselves. We shall be glad to hear further from your society upon its organization.

BUSINESS SPECIALS.

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James W. See, Consulting Engineer, Hamilton, O.

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Ealy's "Blue Book"—Credits of the machinery, hardware, implement and metal trades. Published semi-annually by the National Hardware and Stove Association, 51 Chambers Street, New York, and 79 Dearborn street, Chicago; John W. Ealy, General Manager. This book contains information regarding the capital and pay ratings of over 60,000 dealers and manufacturers, together with a classified list of all manufacturers, wholesale and retail dealers in hardware, iron, machinery, agricultural implements; railway, machinists', engineers' and boiler makers' supplies; brass goods, plumbers, and dealers in plumber's supplies; stoves, tin, cutlery, guns, and the users of iron and metals generally. This reference list has heretofore been confined exclusively to the hardware and metal trades; the machinery trades have been recently added to the long-established features already existing. Furnishing detailed written reports to subscribers of the condition and paying qualities of any dealer is an important feature of the system. Published January and July. Price, $75 for two books, written reports, etc. Address John W. Ealy, General Manager, 51 Chambers Street, New York.

MANUFACTURES.

Sanders Brothers have commenced the erection of a steam saw and planing mill at Nashua, N. H.

A New Ipswich, N. H., machinist has just shipped sixteen job printing presses to Spain.

The Akron, Ohio, Steam Forge Company has increased its capital from $60,000 to $100,000.

Parker, Russell & Co. will erect a hub and spoke factory at St. Louis, Mo.

The Manchester, N. H., Locomotive Works are employing 625 men, and running thirteen hours per day.

The Chickasaw Iron Works, Memphis, Tenn., contemplate erecting a new foundry cupola. Their capacity will be about 9,000 lbs. per hour.

The P. C. Cheney Paper Company, Manchester, N. H., have recently reset their boilers with the Jarvis furnace.

The Champion Mower and Reaper Works, Springfield, Ohio, contemplate erecting a Bessemer steel works and rolling mill for their exclusive use.

The Franconia Iron Company, Franconia, N. H., has been reorganized, and the mines and smelting works will be reopened.

The Reading Iron Works intend to erect a large mill at Reading, Pa., for the manufacture of iron pipe for steam, gas, water, etc.

The Taunton Locomotive Works, Taunton, Mass., are about to ship two eight-wheel locomotives to the Central Mexican Railroad.

J. A. Fay & Co., Cincinnati, Ohio, have recently furnished large orders of woodworking machinery to the Missouri Pacific car shops.

The Bridge-Beach Stove Manufacturing Company, St. Louis, Mo., are building a new pattern shop, and laying the foundation for a large addition to their foundry.

William E. Tanner & Co., of Richmond, Va., whose iron works were recently destroyed by fire, have decided to build fire-proof shops, together with dwellings for their men.

Norristown, Pa., capitalists are negotiating for the purchase of the Fulton rolling mill property in that town, from the receivers of the Reading Railroad Company.

The Chicago Die and Machine Works, Chicago, Ill., have just finished five car wheel grinding machines for the Chilled Car Wheel Grinding Company of Nevada.

The extensive iron works of Boonton, N. J., idle for several years, have been leased by Joseph Wharton, of Philadelphia, and will be put in operation as soon as possible.

William Coutie & Son, Troy, N. Y., have orders that will keep them busy till Spring. Their work is almost exclusively building compound steam engines.

L. S. Bunnell, machinist, Troy, N. Y., is building machinery for stitching knit goods, which, it is believed will work a considerable change in the manufacture of this class of goods.

Knowlson & Kelley, Troy, N. Y., have completed a pair of compound steamboat engines, the behavior of which on the trial trip is highly complimented.

The Sandusky Plow Company, says the *Industrial World*, was organized during the past week, with a capital of $1,000,000. The works will be located in the new town of Garfield, Ohio, where the company has purchased a site.

About $70,000 have been expended on the iron mines at Pittsford, Vt., and a large force is employed in putting up buildings for the manufacture of iron, which will be commenced in the Spring.

The Chicago Rubber Works, Chicago, Ill., will, it is said, immediately commence the erection of works, in which they propose to employ immediately 240 men, and eventually about 500, turning out between one and two million dollars' worth of goods annually.

A company has been chartered and organized at Rome, Ga., to make surveys and estimates, with the view of constructing a canal from a point seven miles above the city, so as to give a fall of thirty feet. With this fall 3,000-horse power will be available for manufacturing.

The firm of Campbell Bros. & Co., Cambridgeport manufacturers of steam boilers, has been succeeded by William Campbell, formerly foreman for Allen & Endicott, under the firm name of William Campbell & Co. They will continue the manufacture of steam boilers at the same place, 356 Main Street, Cambridgeport, Mass.

The Cummer Engine Company, recently incorporated at Cleveland, Ohio, will at once commence the erection of extensive works at that place. It is expected the engine will be largely used for electric lighting. In addition to the Cummer engine, the company will manufacture boilers, pumps, valves, etc

Extensive improvements will shortly be begun on the line of the Chicago & Grand Trunk Railway. The track for the entire distance from Port Huron to Chicago will be relaid with steel rails, and a large amount of new rolling stock added. Among the latter are six English locomotives, brought over because of the inability of American manufacturers to furnish them as soon as required.

The Cincinnati Board of Trade has appointed a committee to inquire into and ascertain the probable cost of a factory or building supplied with water or steam power, and suitable for the accommodation of small manufacturers; and the said committee is also to ascertain and inquire into the best location for building, and if said building can be built by private enterprise or by a joint stock company.—*St. Louis Railway Register.*

Many of our readers will be interested to learn that *Ealy's Blue Book*, which, for the past six years has been published by the National Hardware and Stove Association, and has been confined to credit and pay ratings of the hardware and metal trades exclusively, will hereafter be issued semi-annually—January and July—and will be enlarged to include the various machinery trades. John W. Ealy, 51 Chambers Street, New York, is the General Manager.

The Indianapolis Rolling Mill Company are building a new steel rail mill. The building will be L-shaped, fronting east 120 feet, running west 216 feet, and north 300 feet. The heating department will be in the east wing. The engine for drawing the roll train will be 40x48, of 1,000 horse power. The fly-wheel will have a diameter of 25 feet, and weighs forty tons. The roll train and slating and straightening machinery are being built by the Lewis Foundry and Machine Company, of Pittsburg, and will be set up to roll 60-foot rails. Cooling beds, sawing machinery, etc., to handle 60-foot rails, or two 30-foot rails, automatically, will be put in. A machine and smith shop, 120x40 feet, and a foundry, 72x50 feet, are already in use. The foundry has two cupolas—one 32 and the other 40—and a large air furnace. The capacity of the foundry is thirty tons per day. The machinery, engine, shafting, etc., are furnished by the Atlas Works, Indianapolis, and a 20-ton roll turning lathe is being made by the Lewis Foundry and Machine Company, Pittsburg. —*The Age of Steel.*

Machinists' and Engineers' Supplies.

NEW YORK, Dec. 29, 1881.

Business in the supply market has been remarkably active, considering the fact that this is holiday week, when every one expects at least a temporary lull. A number of business houses and manufacturers have withdrawn all quotations, for the purpose of advancing their prices and issuing new lists at the beginning of the year.

Iron and Metal Review.

The Pig Iron market has been very active during the past week, with large sales at increased prices.

We quote foundry No. 1 at $26.50 to $27; Foundry No. 2 X at $24 50 to $25; Gray Forge, $24. The Foreign Iron market is strong, but not active. We quote Gartsherrie at $25 to $26; Coltness, $26.50 to $27; Glengarnock, $25; Carnbroe, $25; Eglinton, $24. Steel, Iron and Old Rails unchanged. Prime Wrought Iron Scrap, $32.50.

The demand for copper is fair at 20½c. for Lake Superior. Straits Tin, 24c. to 24½c. Australian and Billiton the same. Lead, 5½c. to 5¼c.; Spelter, Western, 5⅞c. to 6c. Antimony 14¼c. to 14½c. for Cookson, and 13c. for American.

WANTED

Wanted—Several first-class men to erect engines. Address The Hartford Engineering Co., Hartford, Conn.

A machinist with best references wishes a situation as foreman or superintendent. Address Box 702, Lowell, Mass.

Wanted—A skillful mechanical draughtsman; also a first-class pattern maker. Enquire or address, S. R. Krom, 153 Cedar Street.

Wanted—Parties with capital and tools to manufacture my improved Oscillating Engine, Pat. Feb. 3d, 1880. The cheapest engine built. J. F. Kingsley, Sayre, Bradford Co., Pa

Wanted—A thorough machinist wants situation as special toolmaker, foreman or superintendent in machine shop or manufactory. Address Box 354, Watertown, Mass.

A mechanical draughtsman, with seven years practical experience in steam engines and general mill machinery, requires situation. Address Box 11, AMERICAN MACHINIST.

A young Swede, graduated from Technical High School, and with some experience, desires a position as draughtsman. Address Simon, Westboro, Mass., Box 881.

Wanted—A millwright in a wood-working establishment that can make patterns. None but sober, steady men of experience need apply. Address S., care Chester and Harris Mfg. Co., St. Louis, Mo.

Wanted—Situation as foundry foreman, by one who has had long experience, and thoroughly understands the business in all branches. Best references. Address Expert, AMERICAN MACHINIST office.

A machinist of twenty years experience in the various branches of the trade, would correspond with parties desiring his services as foreman of shop or department. Well acquainted with tool making, dies, etc. References if desired. Address G., Box 5, AMERICAN MACHINIST.

A mechanical engineer and draughtsman desires a situation in chemical or manufacturing establishment, to take charge of machinery, its erection or manufacture. Fifteen years experience in drawing room and workshop. Address F. S., care 172 Varick Street, New York City.

A large company wants a mechanical engineer, who understands, theoretically and practically, steam and machinery, and who can manage men, run the machine shop, foundry, etc. He will not be required to attend to the commercial business. To a competent man a liberal salary will be paid. Address, giving age, married or single, references and salary expected, Box No. 262, New York P. O.

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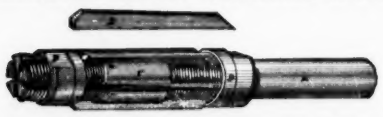

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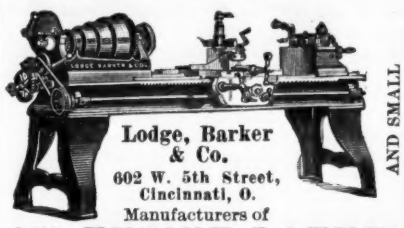

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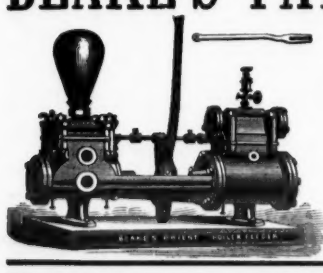

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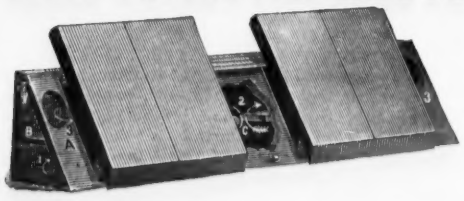

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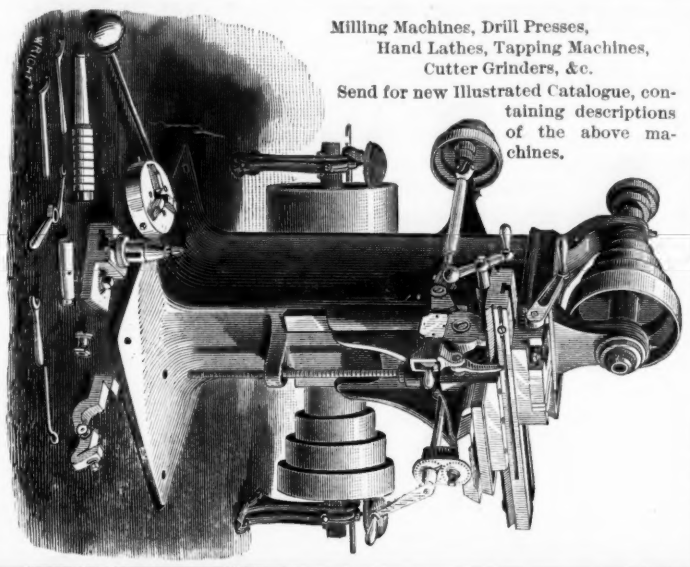

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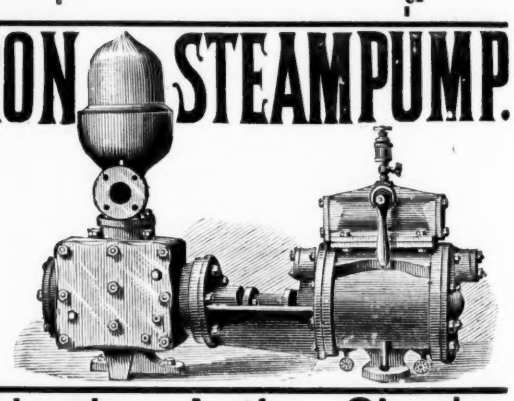

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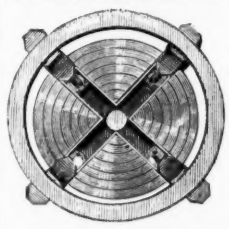

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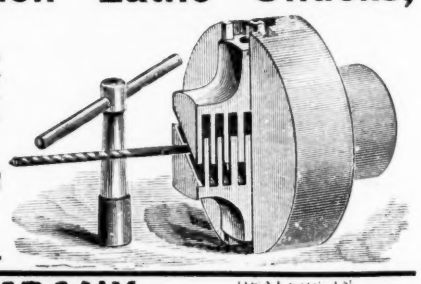

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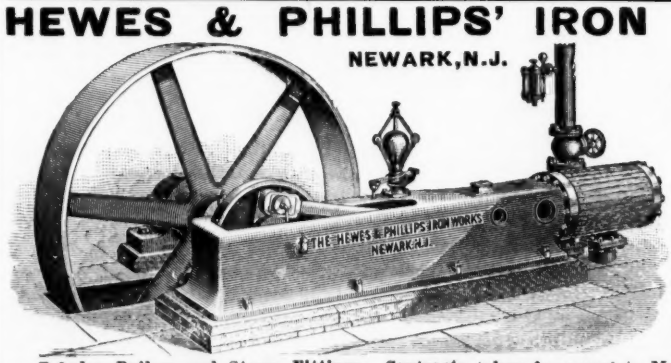

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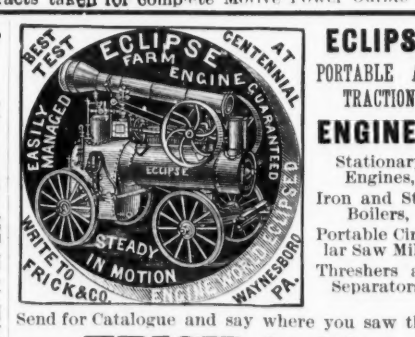

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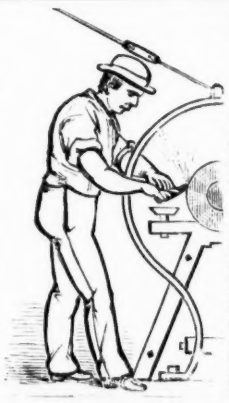

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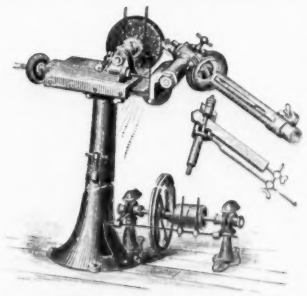

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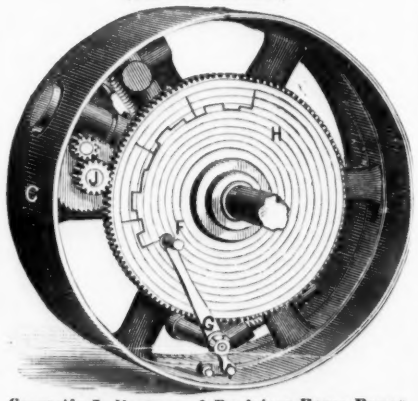

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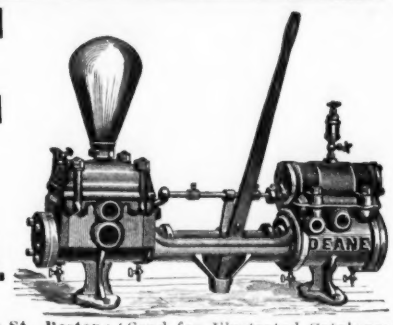

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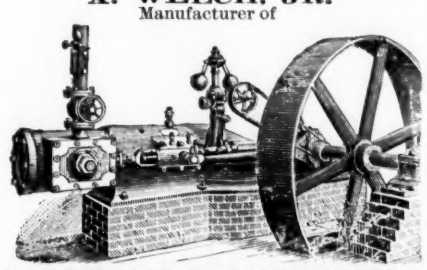

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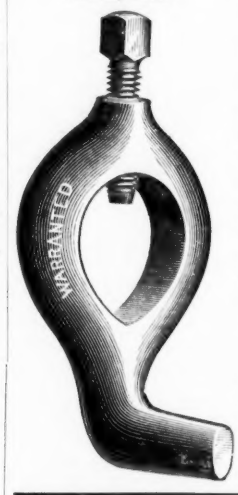

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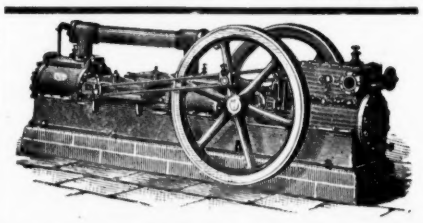

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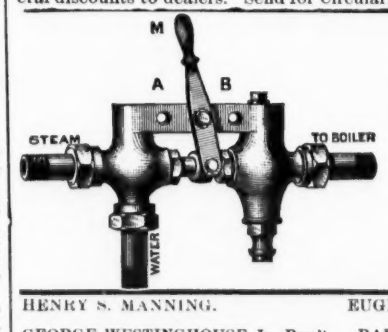

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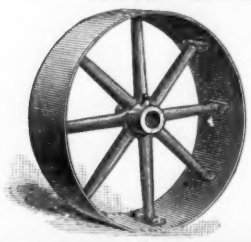

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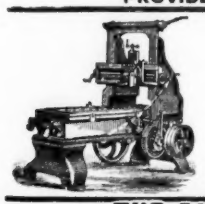

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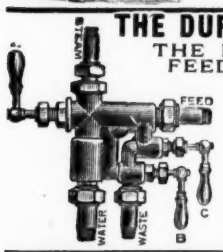

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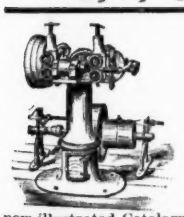

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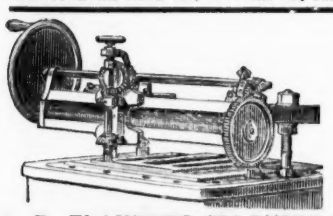

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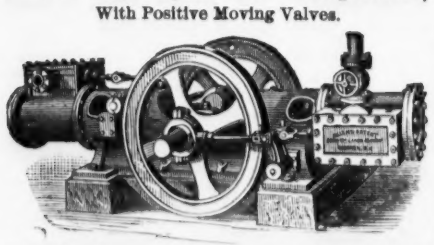

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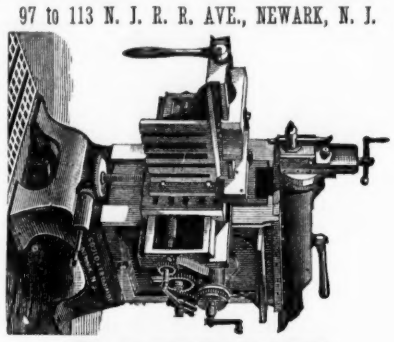

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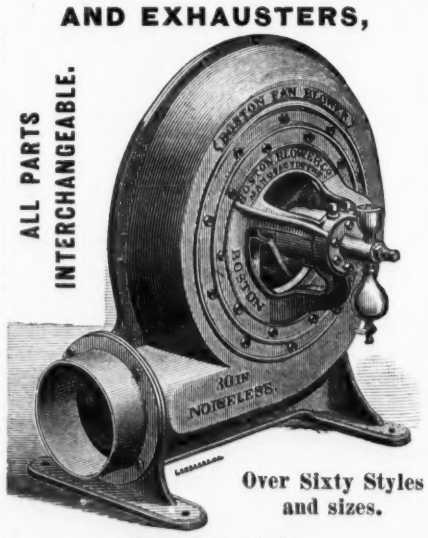

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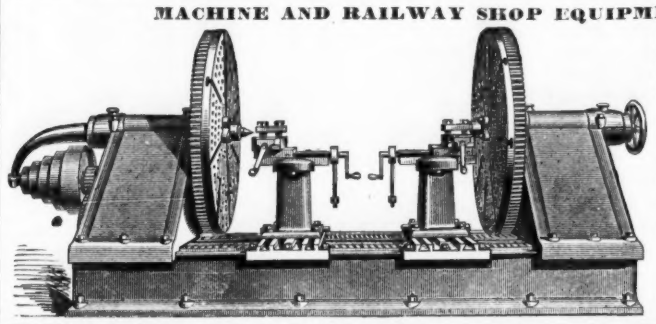

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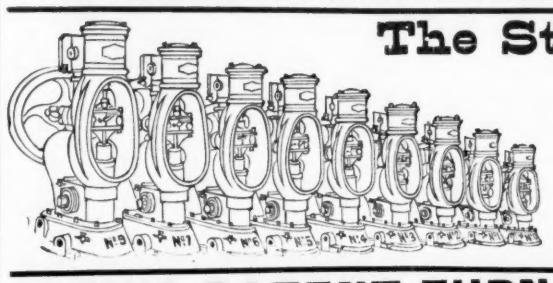

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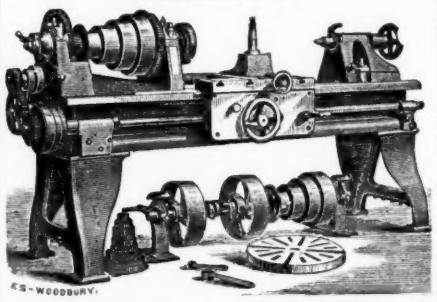

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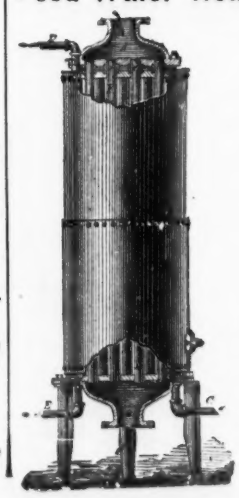

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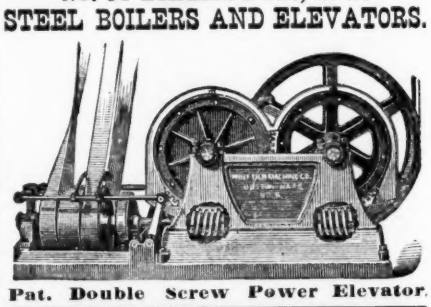

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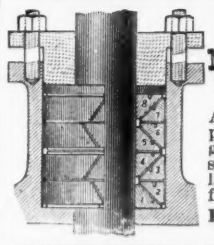

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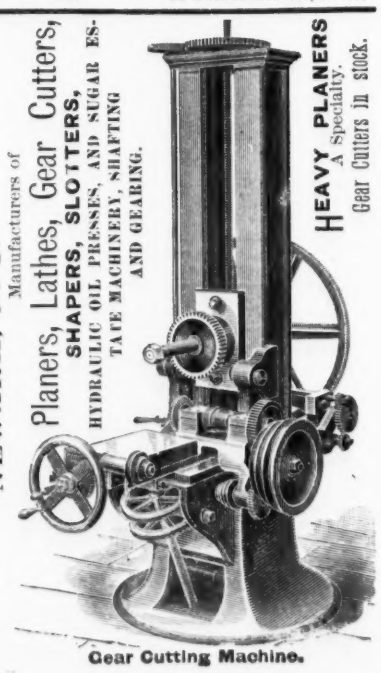

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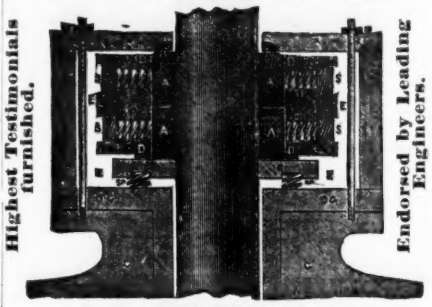

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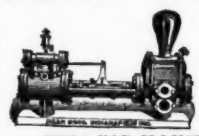

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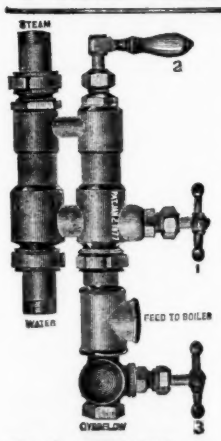

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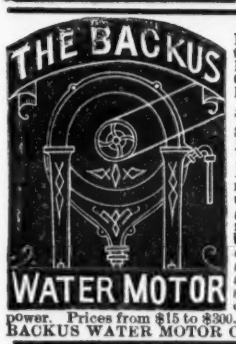
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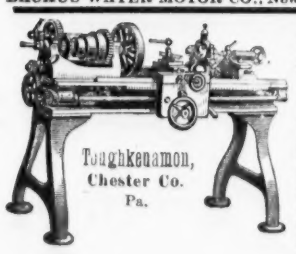

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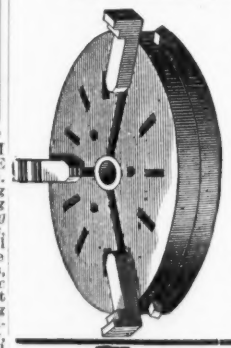

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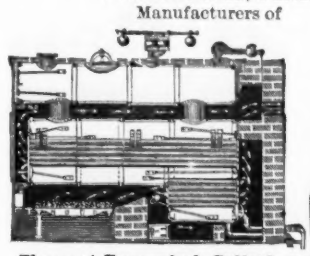

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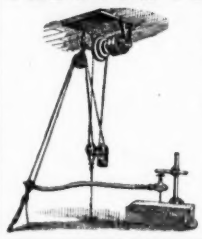

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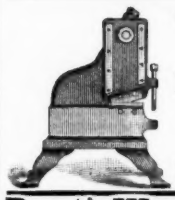

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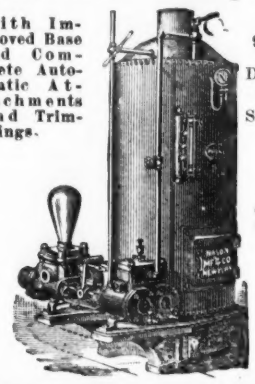

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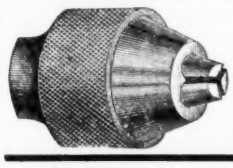

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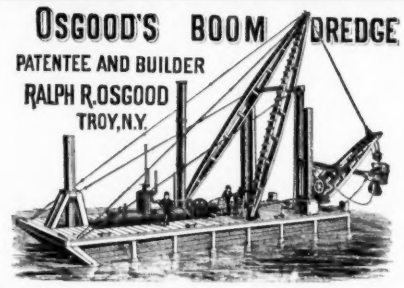

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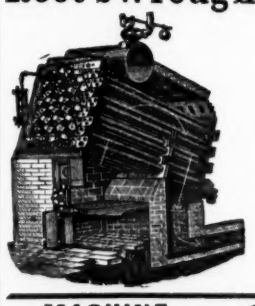

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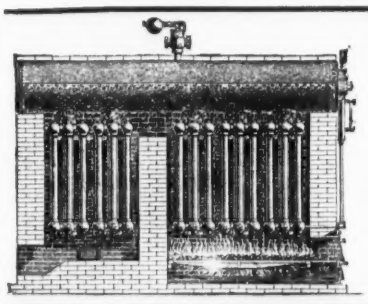

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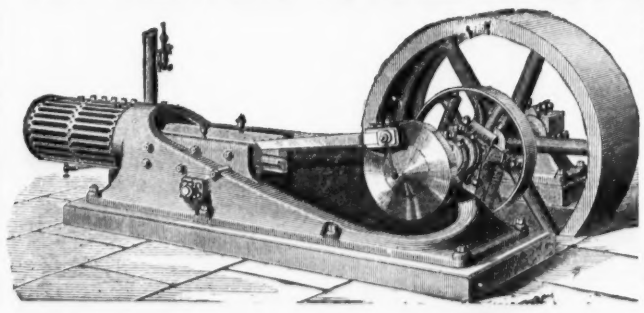

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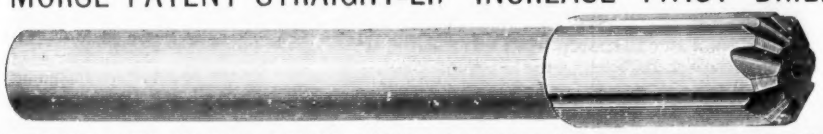

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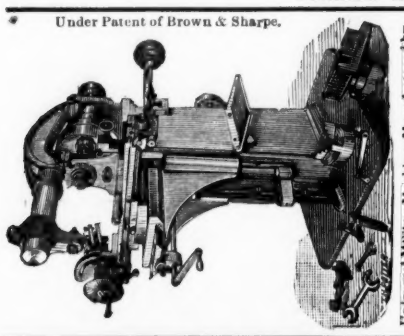

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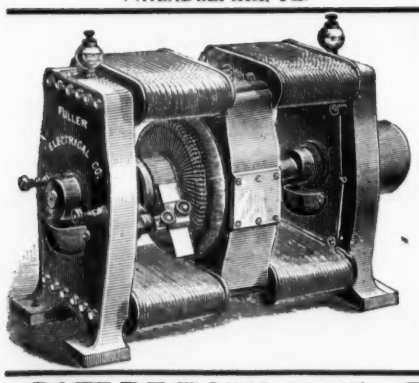

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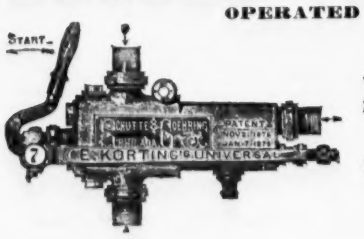

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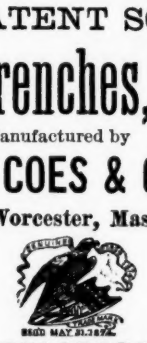

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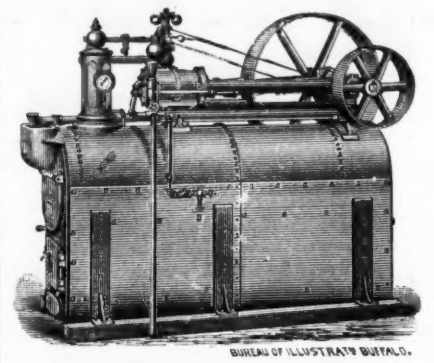

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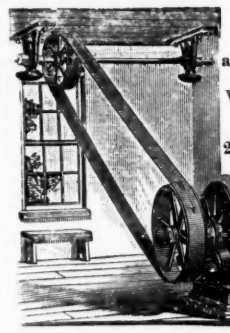

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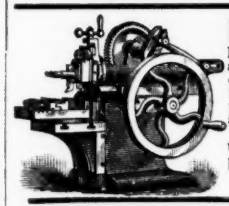

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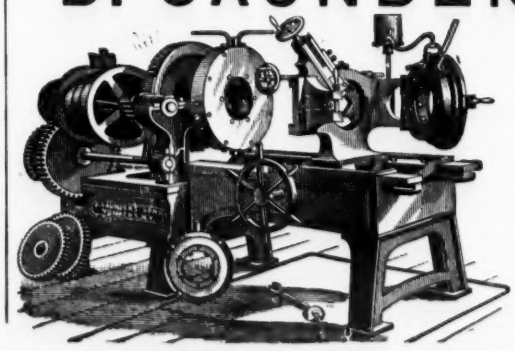

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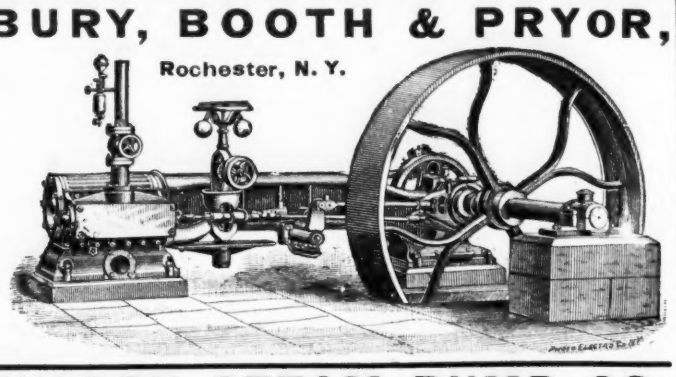

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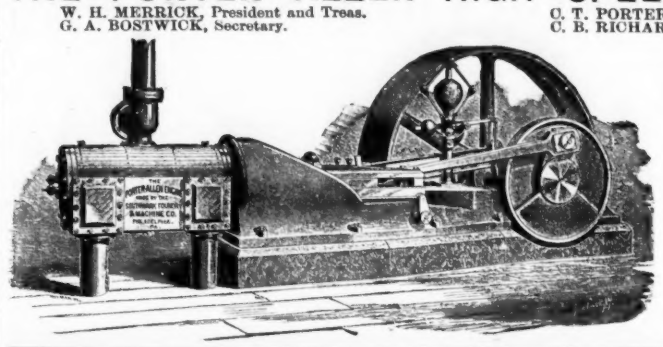

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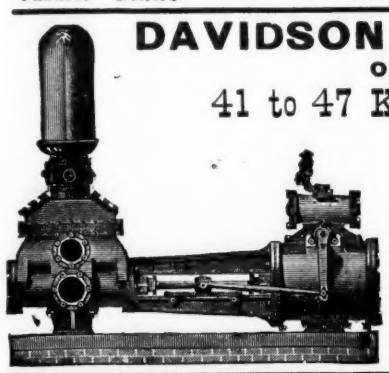

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Warranted the Best Pump Made for all Situations.

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Safe, Durable and Reasonable in Price.

Friction Clutch Pulleys and Cut-off Couplings.

We manufacture the "Giant Friction Clutch Pulley," known as the "Captain." Is the **Best in the World** for connecting the gearing of callender rolls, hoisting coal, logs or freight. Our Clutch can connect any amount of power, at any speed, without slacking the motive power in the least, and gives no shock, is easy to ship and unship, in fact, this is the only Clutch that can do heavy work satisfactorily.

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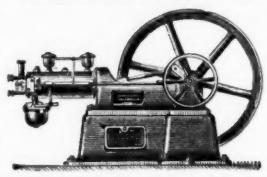
NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.

Started Instantly by a Match, it gives full power immediately.

When Stopped, all Expense Ceases.

No explosions; No Fires nor Cinders; No Gauges; No Pumps; No Engineer or other attendant while running.



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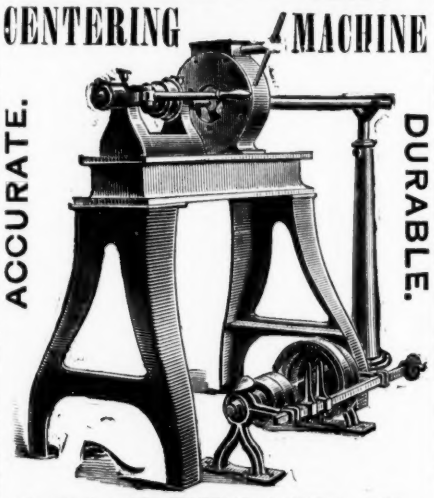

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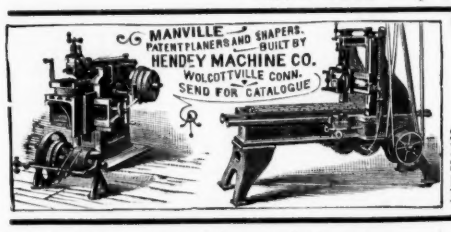

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15 in. Shapers, 24 in. Shapers, 3½ ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 8 ft. x 24 in. Planers, Amateurs' Hand Planers, with chuck and centers, Hollow Steel Spindle Hand Lathes, Brass and Wire Slitters, Spring Chuck, and Common Clock Lathes. Catalogue gives many names of users of our tools.

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The New Measuring Instrument.

By simply passing it over a surface the exact distance in feet, inches and fractions is recorded on the dial. Supersedes Rule and Tape. Measures Routes on Maps. Large ones in Brass cases, 100 ft. Miniature wheel measures, nickel, 10 ft. for watch pendants.

JACKSON & TYLER,
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Fine Tools of all kinds, Lathes, &c.

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DECEMBER 28, 1881.

Two Car Axle Lathes. Hewes & Phillips. New.
One Hor. Boring Lathe, 52 in. x 13 ft. L. W. Pond. In good order.

One Engine Lathe,	36 in. x 15½ ft.	A1 order.		
One	" " 30 in. x 15½ ft.	New Haven.		
One	" " 28 in. x 16 ft.	Fifield.	New.	
One	" " 28 in. x 12 ft.	"	"	
One	" " 24 in. x 12 ft.	Ames.	New.	
One	" " 24 in. x 10 ft.	New Haven.		
One	" " 20 in. x 14 ft.	Fifield.	New.	
One	" " 20 in. x 12 ft.	Harrington.	A1.	
One	" " 20 in. x 10 ft.	Pond.	A1.	
One	" " 20 in. x 10 ft.	Fifield.	New.	
One	" " 20 in. x 8 ft.	Ames.	New.	
One	" " 18 in. x 10 ft.	Jones & Lamson, New. 1⅛ in. Hole in Spindle.		

Three Engine Lathes 18 in. x 8 ft. Jones & Lamson New.
One Engine Lathe, 18 in. x 8 ft. Michael. Good order.
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One Engine Lathe, 16 in. x 6-7-8 ft. Bridgeport Mch. Tool Works. New.

Six Engine Lathes,	16 in. x 6 ft.-7ft. x 8 ft.	Ames.	New.	
One	" " 15 ft. x 8 ft.	Pratt & Whitney.		
One	" " 15 in. x 6 ft.	Flather's.	New.	
One	" " 15 in. x 5 ft.	Jones & Lamson.	New.	
Three	" " 14 in. x 6 ft.	Star Tool Co.	New.	
One	" " 14 in. x 6 ft.	Hand.	New.	
One	" " 13 in. x 6 ft.	Ames.	New.	
One	" " 13 ft. x 4½ ft.			
Two	" " 11 in. x 5 ft.			
One Hand Lathe,	11 in. x 4½ ft.	New Spencer.		
Two	" " 7 in. x 2½ ft.	"	"	

One Planer, 15 in. x 3 ft. Snow. Good order.
One " 18 in. x 42 in. Good order.
One " 22 in. x 5 ft. Hendey. New.
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One Crank Planer, 12 in. stroke. A1 order.
One 6 in. Stroke Shaper. Boynton. New.
One 20 inch Stroke Shaper. Gould & Eberhardt. New.
One 16 in. Upright Drill. Prentice. New.
Two 20 in. " " Prentiss. New.
One 24 in. " " Ames. New.
Three Sensitive Drills.
One Lincoln Miller. Pratt & Whitney. No. 2.
40 Lincoln Millers and Vises. Good order.
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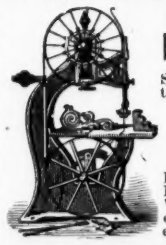

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Second-Hand and New Machinery.

December 29, 1881.

The following New and Improved Machinists Tools are part of what we have for early delivery:

1	22 in. swing, 13½ ft.	Bed Engine Lathes.	January.	
3	18 in. " 10 ft.	" "	"	
3	18 in. " 8 ft.	" "	"	
2	15 in. " 6 ft.	" "	"	
2	30 in. "	Upright Back Geared Drills	"	

The following in store:

5	22 in. swing, 12 ft.	Bed Engine Lathe.	2d-hand	
1	19 in. " 6 ft.	" "	"	
2	18 in. " 10 ft.	" "	New.	
2	18 in. " 8 ft.	" "	"	
2	16 in. " 6 ft.	" "	"	
4	16 in. " 7 ft.	" "	"	
1	17 in. " 6 ft.	" "	2d-hand.	
1	17 in. " 7½ ft.	" "	"	
1	15 in. " 5 ft.	" "	"	
1	12 in. " 4 ft.	" "	"	
1	21 in. " 10 ft.	Bed Turret Head Lathe.		
1	15 in. " 5 ft.	Bed Hand Lathe.	2d-hand.	
3	12 in. " 6 ft.	" "	New.	
1	10 in. " 4½ ft.	" "	"	
1	9 in. " 3 ft.	" "	"	

1 38 in swing Pulley Lathe, new.
1 Round Arbor Fox Lathe.
1 36 in. x 36 in. x 9 ft. Betts Planer. New.
1 12 in. x 12 in. x 2 ft. Planer. Hand or Power.
2 15 in. Hendey Shapers. New.
2 48 in. Swing Radial Drills. New.
1 36 in. Car Wheel Borer. Nearly new.
1 21 in. Upright Drill. Nearly New.
2 24 in. Harris Upright Drills. Second-hand.
2 Wall Drills, heavy. Second-hand. 60 and 72 in
1 3 Spindle Drill. New.
1 Pratt & Whitney Cam Cutter, 2 heads. Fine.
1 Newton Milling Machine. New.
2 Milling Machines, Lincoln pattern. Second-hand
2 Manhattan Arms Co. Millers. Second-hand.
1 Sellers Milling Machine. 2d-hand.
1 Face Milling Machine. Second-hand.
1 Pond's Double Milling Machine. 2d-hand.
1 Garvin " " "
1 Screw Head Slotter. Second-hand.
3 Second-hand Profiling Machines.
1 Vertical Centering Machine. Nearly new.
3 4½ in. Horizontal Centering Machines. New.
3 Emery Grinders. 2d-hand.
1 Sellers' Tool Grinder. "
1 Pipe Cutting Machine. Second Hand. 2 in.
1 Bolt Cutter, 1½ in. New. With Taps and Dies
1 Bolt Pointing Machine. Second-hand.
3 Pulley Forcing Machines. Second-hand.
1 Horizontal Boring Bar, 12¼ in. diam. " "
1 " " Machine, Small. 2d-hand.
1 " " " 4 spindle "
1 Betts, No. 2, Power Punch. New.
4 Double-Acting Presses, No. 3, nearly new.
4 Single-Acting Presses, for power, "
100 Foot Presses, nearly new.
1 Medium Power Punching Press. Second hand.
2 Small " " Presses. "
1 Foot Punch, with bench. New.
1 Lot Pistol Machinery. Second hand.
2 Grind Stones and Frames Second-hand.
1 Crane. Second-hand. 20 ft. jib. 6 Tons.
Lot of Forges, 1 Jig Saw, 1 Double Saw Bench, 1 Band Saw, 1 Slat Tenoner, 1 Railway Saw Bench, 1 Foot-power Circular Saw.
Cold Rolled Shafting, Pulleys, Hangers, Couplings, &c., always in store.

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On Hand Ready for Immediate Delivery.

15	inch swing,		6	feet bed,	Reed Screw Cutting Engine Lathe.				
15	"	"	6	"	"	Flather	"	"	"
16	"	"	7	"	"	Wheeler	"	"	"
18	"	"	8	"	"	Wight & Powell Screw Cutting Engine Lathe.			
18	"	"	10	"	"	"	"	"	"	"	"
18	"	"	10	"	"	Blaisdell	"	"	"	"
20	"	"	12	"	"	Ames Mfg. Co.	"	"	"	"
22	"	"	14	"	"	"	"	"	"	"	"
24	"	"	12	"	"	"	"	"	"	"	"
24	"	"	12	"	"	Putnam Machine Co.	"	"	"	"
26	"	"	16	"	"	Niles Tool Works	"	"	"	"
30	"	"	15	"	"	Ames Mfg. Co.	"	"	"	"
30	"	"	23	"	"	"	"	"	"	"	"

Gleason Iron Planer, 36 in. x 36 in. x 12 ft. with two heads.

Upright Drills, Radial Drills, Shapers and Bolt Cutters.

HILL, CLARKE & CO.

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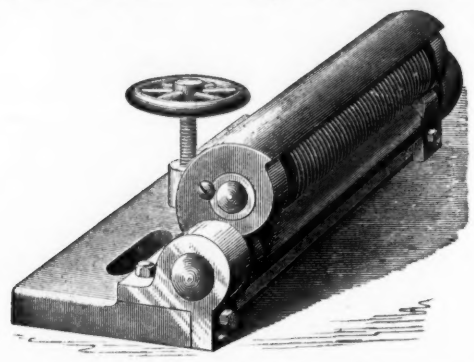
GRINDSTONE TRUING DEVICE.



One of the most disagreeable things to be done in a workshop is the Truing of Grindstones. It is, therefore, often the case that they are allowed to become quite out of shape and untrue, very much to the annoyance of the workman, who finds it almost impossible to grind his tools in a proper manner. The above cut illustrates a device which is well adapted for truing and keeping the face of grindstones constantly in good shape. This can be instantly applied to the face of the stone, working automatically, without interfering with the constant use of the stone, and does the truing without raising any dust.

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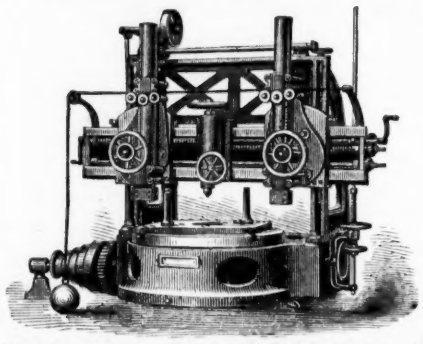

5, 6, 7, 8, 10, 12, 14 and 16 Feet Swing.

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Read the following Report of the performance of our Mill.

Salem, Col. Co., Ohio, Nov. 27, 1880.

We have just finished another pulley, 12'x27" face, weight 8860 lbs. Yesterday morning at 9 o'clock the rough casting lay on the floor by the mill and we commenced putting on the machine; got a cut started at 10.45 a.m.; finished the rim complete by 9.30 p.m., and got started on facing and boring the hub by 10 p. m.; started again at 7 a.m. this morning, and the pulley off at 11 a.m., 17 hours work all told, including handling on and off The casting was not a very true one and we chose to take three cuts over the face. Hub was 18" deep, with straight core, bored to gauge and chamber on the machine. Hub faced on one side. If you hear of better time let us know—only 10¾ nours on the rim of pulley. Truly yours,

JOEL SHARP, PREST. BUCKEYE ENGINE CO.

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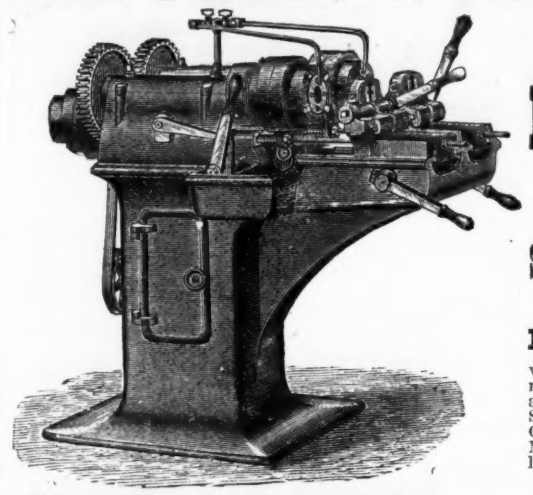
HAMILTON, OHIO.

THE PRATT & WHITNEY CO.



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SCREW PLATES,

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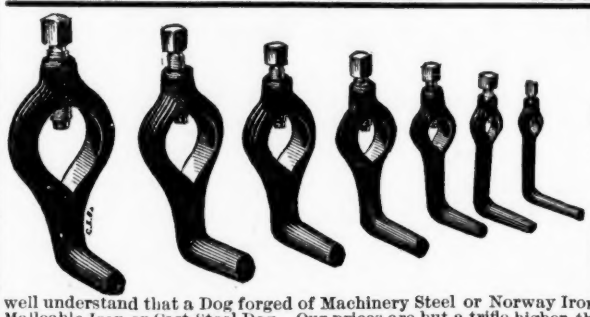

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We make these Dogs in 12 sizes, running from ¾ to 4 inches. We guarantee the three smaller sizes to be forged of Bar Steel, and the nine larger sizes of Norway Iron. Any intelligent mechanic can well understand that a Dog forged of Machinery Steel or Norway Iron is a better article than a Cast Malleable Iron or Cast Steel Dog. Our prices are but a trifle higher than the Cast Dogs, and from the fact that we have not been able to supply the growing demand for them, convinces us that our goods are appreciated. Send for illustrated catalogue and price list.

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JOHN J. GRANT. **JOHN L. BOGERT.**

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It is their determination to send out only first-class machinery. They are striving to put on the market tools equal in material, design and workmanship to the best ever offered to the public. They have patterns in hand for a

22 INCH LATHE,

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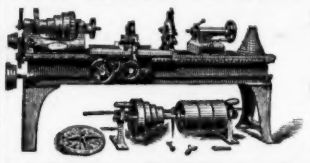

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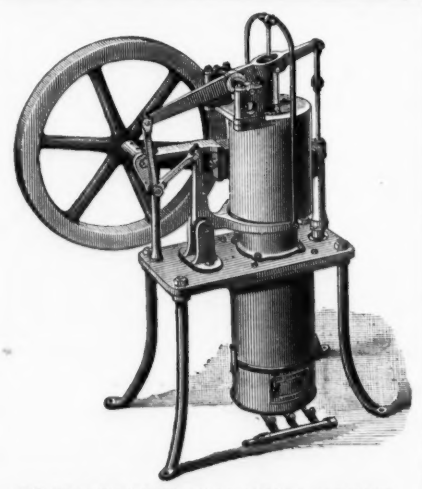

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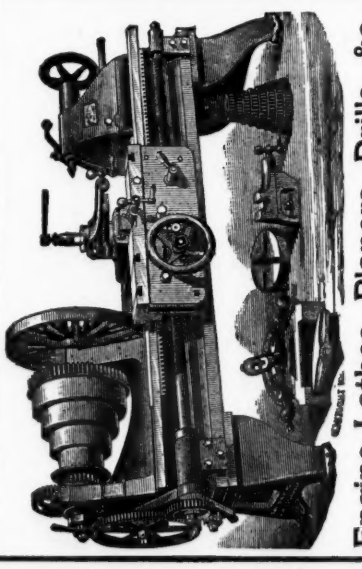

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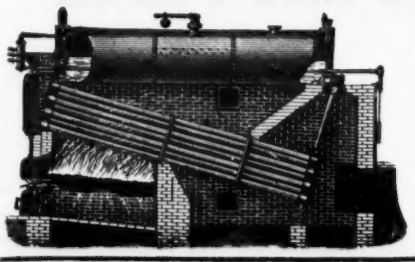

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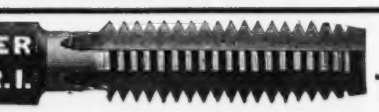

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